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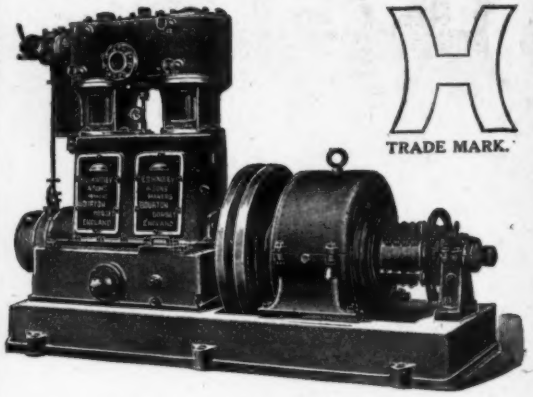

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VOL. LXXXVIII. MARCH 4, 1921. No. 2,258.

ELECTRICAL REVIEW.

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REPARATIONS AND BRITISH INDUSTRY.

OUR readers are aware that the Allies have decided upon the indemnity payments which Germany shall be called upon to make in respect of her crimes against civilisation. They begin with a payment of one hundred million pounds, rising by various stages to three hundred millions, the whole being spread over 42 years. The question whether these terms are too severe, or not severe enough, is not one with which we feel specially concerned, but it is worth while to consider the probable effects, not only of the fixed payments, but of the additional tax of 12 per cent. on Germany's export trade, upon British trade in general.

We have already seen that the dumping of two million tons of shipping upon a market in which there was already a surplus, inevitably resulted in further depression in the shipbuilding industry. It now appears probable that the greater part of this tonnage will have to be laid up, and remain idle, the while the British population pays taxes for its upkeep, and the services which this shipping might render are lost to the world.

There is no doubt that the importation of foreign material, of any kind, and for any purpose, renders unnecessary the production of an equal amount of the same material in the country into which the goods are imported. The indemnity payments must be made in goods—raw or manufactured. Therefore, when the Allies say: "We will have a hundred millions from Germany this year," they merely use an alternative phrase for: "We will not manufacture a hundred million pounds' worth of various goods this year." When France demands a million tons of German coal, she refuses, in effect, to buy a million tons of British coal. That is one aspect of the situation, so far as the fixed payments are concerned.

Dealing now with the export duty, we observe that Lord Sheffield, in a letter to the *Manchester Guardian*, considers it "idle to suppose that an export duty of 12 per cent. can be passed on to the purchaser," and "it may be inferred that an export duty of 12 per cent. will kill many of Germany's export trades." We have heard it argued that, while an import duty must be paid by the consumer, yet this is an export tax, and is paid by the manufacturer in the country of origin. Out of what? Clearly, out of the revenue derived from export sales; out of the money paid by the buyer. In short, the consumer pays—there is no one else *to* pay! This export tax will be passed on, and the mark will be kept low, and buyers of German goods will pat themselves on the back as they say: "It is a good thing to buy German goods, as the Germans have to pay twelve per cent. of this money towards the indemnity." Whatever may be said about the fixed payments, there is no doubt that the *ad valorem* tax is bad, and will encourage German competition; while it keeps the exchange in such a state that it will be impracticable for us to export to Germany, and her prices in other countries, such as Holland, are so much lower than British prices as to make it equally impracticable for us to export to those countries.

So far as Germany can be compelled to assist in the cheapening of prices by a large contribution to production, it is good that she should do so, but cheapness

will be dearly bought if this policy is overdone, and results in greater, increasing, and permanent unemployment. Production must be maintained here, and the German goods must be of the nature of a surplus, to encourage demand, and so cheapen production here, with resultant benefit all round.

Is this likely to happen? Candidly, we do not think so. The situation in the dyestuffs industry, mentioned in our columns recently, is eloquent and prophetic in this respect. The prospect of heavy importations of dyestuffs and chemical products from Germany proved so alarming, that an elaborate system of licensing was evolved, which has the substantive effect of prohibiting the import of any chemical product that can be made in Great Britain. We deliberately and definitely refused, when it came to the point, to receive what had been hailed as "benefits" when the Treaty of Versailles was in the making.

We mentioned the case of France and the German coal. Let no one be too ready to throw stones in this matter, for, in our view, none are free from blame. Prices for coal for export had reached fantastic levels, yet, with the French mines not yet at their full output, British coal found its market. When the coal strike came, the lighting of Paris, for instance, was immediately curtailed and diminished, and the French bought coal wherever they could get it. At the same time large deliveries of coal were received from Germany under the indemnity, so that there was actually a glut of coal in France. The combination of profiteering and striking has ruined the French market for coal, and none can tell when it will recover. So we are confronted with the prospect of lost export markets, the Government dropping the whole coal question like a hot potato, and the raising of the prices of all coal used in this country. The cynical disregard of the interests of the consumer, displayed by all concerned in the coal question, would have been unbelievable, had we not by this time become hardened to such treatment. The miners demanded more pay because, they said, the money was in the industry. They coupled their demand for increased wages with a demand for a decrease in the price of domestic coal, which sounded very handsome of them, but unfortunately they dropped it almost at once, thereby casting serious doubts upon their own sincerity. The coal owners rioted in the export market, instead of laying the foundation of permanent and satisfactory business relations, with the result that customers are glad to be able to buy elsewhere. So the home user, disappointed of his reduction, is confronted with the likelihood of having to pay still more, while production falls off at the first hint of a drop in wages.

But what of our own industry? Up to the present German competition has not been serious in the home market, though it is already difficult, if not impossible, to meet it in certain European markets. In those markets which are predisposed in our favour, it remains for the British manufacturer to embark on a really serious selling campaign. Publicity methods must be constantly and steadily improved. Catalogues, printed in the language of the country for which they are intended, must attract attention to, and awaken interest in, British goods. Strenuous spade work of every description must be kept up until the customers feel the need for the service which British firms can render. When goods are ordered, delivery must be prompt, and quality high; and there must be a willingness, an anxiety, to do the best thing for, and the right thing by, the customer, not only at the first, but all the time. Any aloofness, any feeling that this is all a great nuisance, must be rigidly repressed. The consumer pays, and he will call the tune. If the British manufacturer gives the service required, a little earlier, and a little better, than his competitor, he will get business and prosper. If he fails, then he will play straight into the hands of Germany, and will lose, finally, all the advantages which, owing to Germany's crippled condition, he is now in a position to use.

Dutch Industries Against State Stations.

The discussion of the Dutch Government Bill which proposes to centralise the production of electricity in the hands of a semi-State company has now commenced in the Second Chamber of the States General. Some particulars regarding the scheme are given elsewhere in this issue. The Bill is meeting with considerable opposition both in the Chamber and outside, and attention may be drawn to that of the Central Industrial Union, which is acting on behalf of approximately 600 of the most well-known undertakings in the metal-working industry, shipbuilding, and the cotton, wood, paper, chemical and other industries, which through the Union have presented a petition to the Second Chamber asking for the rejection of the Bill. If no system of electricity supply in general existed in Holland, the petition points out that there might perhaps be occasion for such a centralisation as is projected by the Bill. But as provincial Government or private central stations are to be found in almost every province or town of any importance, which have hitherto satisfactorily served the interests of consumers in general, the petitioners do not see why the law need be invoked in such a decisive manner as is proposed by the Bill, and they express the opinion that the efforts of the State would suffice if directed towards the establishment of connections between existing stations, the unification of the primary high-pressure networks, and the supply of the more or less important centres which still require such facilities. The petition proceeds to state that it is not decisively demonstrated in any of the official documents that the construction and working of the so-called super-stations would be more advantageous than in the case of the stations of medium size such as are managed in Holland by local authorities or private enterprise. On the contrary, it is submitted that it is sufficiently well known from all kinds of statistics and examples available that the stations of average size are more economical to work and are more economically worked than the largest stations existing in Holland at the present time. It is further apprehended that the management of super-stations would not be so economical or of a commercial character, while the management would very probably be bureaucratic. The situation in Holland should not be compared with that in other countries where large stations are situated in the vicinity of the collieries, whereas the only economically possible State central station in Holland is in the Limburg coal-mining district. It is further emphasised that the flexibility in the charges made for supply by private works, which are now frequently adapted to the requirements of consumers, would be materially reduced in the case of State undertakings. Under these circumstances the petitioners ask the Second Chamber to reject the Bill or to substitute for it a measure for the supervision of the industry in the directions previously indicated.

Russian Electrical Schemes.

Some time ago great schemes were announced from Moscow concerning the projected electrification of the whole of Soviet Russia, and new proposals representing the splendid situation which that country will occupy when the electrical schemes have been realised are said now to be circulated every week by the Russian wireless system in the form of propaganda reports. In contradistinction to these fantastic statements is a report published by the Moscow *Isvestia* on February 1st from the Bolshevist Wasjkof. The latter states quite openly that at the present moment Russia is confronted with the entire exhaustion of all stocks of raw and other materials which are necessary for the electrical industry, and that the maintenance of the existing electrical installations is only possible on a primitive footing. The electrical industry which numbered 3,200 workmen in the spring of 1920 now has only 700, all the skilled men are foreigners, and not one half of the production contained in the 1920 programme has been carried out. The programme for 1921 has been considerably reduced, but its execution depends upon the requisite raw and other materials being rendered available to the industry.

Electricity Supply Schemes.

The exhaustive inquiry which the Electricity Commissioners have held at Llandudno has elicited many interesting points, and suggests many others. For instance, there is a striking contrast between the attitudes of the promoters of the two schemes. Although the Chester Corporation scheme appears to be more fully thought out and more definitely drawn up than that put forward by the South Lancashire Conference, it is somewhat less concrete and substantial than that of the North Wales Power Co. This is particularly noticeable in the financial and administrative aspects of the schemes. It will be admitted that a scheme prepared for and on behalf of a conference of municipal authorities and supply companies must inherently possess some features of weakness and lack coherence, more especially in view of the neutral and even hostile attitude of some of the local authorities and other interested parties, which has been so regrettably manifest at the inquiries; a scheme drawn up by a power company, on the other hand, with a backing of unanimity, experience, and commercial ability, is practically certain to be a sound and practicable scheme from the very outset. That is the essential difference between the two cases; one is managed by a committee, or a committee of committees, composed of men who are not necessarily experts either in commerce or in engineering, while the other is conducted by a very small number of men whose profession it is to carry on that very class of business. The inevitable result is that the former must always be regarded as being somewhat speculative, or even tentative, whilst the latter has the air of solidity and trustworthiness that arises out of technical competence and financial support.

And this brings us to a very important aspect of the subject. It has been conspicuously evident at these inquiries, as it was at the Barking inquiry, that the municipal authorities have no financial backing. When the time arrives for a Joint Electricity Authority to raise funds to carry out its scheme, it will have to go into the open market for the money; what that means may be inferred from the experience of Birmingham, Rotherham, and other corporations during recent months. Certainly if the authorities look to the Government for capital, they will look in vain. The municipalities no longer occupy that privileged position that they used to hold, of being able to raise capital on exceptionally favourable terms. The companies, however—as witness the statements of the County of London Co., the North Wales Power Co., and others—have capital at their command, and are ready to get to work at once.

The conclusion is plain enough. Financiers have confidence in projects put forward by commercial concerns of proved experience and competence, which can be safely counted upon to make an adequate return on capital invested; they have little confidence in the somewhat uncertain future of the municipal schemes, still less in the shadowy projects of the proposed Joint Electricity Authorities.

That the work would be better done by a company than by any State or Communal organisation we have never doubted, though we realised that in the face of the overwhelming wave of public opinion which followed the Armistice the electricity supply industry must come under national control. The establishment of the Board of Electricity Commissioners was an act of the greatest value to the industry, and a vast amount of useful work has already been accomplished by it. But judging by the inquiries which have been held, the prospect of the formation and efficient operation of Joint Electricity Authorities is receding into the background. The alternative is to authorise the existing power companies to carry on the work for which they were constituted, under the control of the Commissioners, and as time goes on, the probabilities in favour of this course being adopted are strengthening.

Read, Mark, Learn . . .

It would be interesting to know how many of the secretaries and members of the Joint Industrial Councils for the Electricity Supply Industry have taken the trouble to read through the series of Whitley Reports; how many could pass anything like an examination in them? And yet in no other way can anyone get a full knowledge of the theory underlying the Councils and of the principles which are supposed to be adhered to in developing their constitution. The question of a close adherence to the principles laid down in the Reports is not merely a matter of academic concern; its importance is paramount. These Councils were formed at the invitation of the Ministry of Labour, and the form laid down was that outlined in the Whitley Reports. So long, therefore, as the Councils follow the lines of the Reports, so long may they reasonably expect the Ministry of Labour to back them up; but if they depart from the procedure laid down, they must take the inevitable risk.

This is why we insist on the paramount importance of everyone who has anything to do with the Councils being perfectly familiar with the Reports. Here is a case in point, where either through ignorance of the principles laid down in the Reports, or through wilful or unwitting departure from them, a District Council has, it seems to us, made a serious blunder. We refer to the booklet of constitution issued by No. 11 District Council for the South Coast area. In the front is given a list of the names of members of the Council. Those representing the employers read: Councillor H. Ainger, representing Aldershot U.D.C. undertaking; Alderman R. J. Bridle, representing Weymouth Corporation undertaking; and so on. Now, it is entirely wrong to say that any member of a Council represents on it an individual undertaking. It is wrong even to suggest that he is appointed by any individual undertaking. And in the constitution the method of election, namely, that certain undertakings shall elect a member in their own right, is most seriously unconstitutional. Every member of a Council on the employers' side is supposed to be appointed by one of the Employers' Associations, and the whole of the members on any District Council represent each and every undertaking in its area.

The Whitley Report is definite and emphatic on this point. Par. 14 of Cd. 8606 reads: "That District Councils, representative of the Trade Unions and of the Employers' Associations in the industry, should be created." And in the Appendix to the same Report we read: "It is intended that the Councils should be composed only of representatives of Trade Unions and Employers' Associations." Now, referring to No. 11 Council, the booklet taken literally says that 12 undertakings have each a representative on the Council. Suppose one of the other undertakings in the area says: "We will not recognise any of your recommendations, we are not represented on your Council"—what will No. 11 Council reply? On the same grounds, it would seem that No. 10 District Council (which surely should be a model!) is also indiscreet in its list of members on the employers' side. It does not go so far as to say that any member "represents" an individual undertaking, but it prints the name of each member's company alongside of the member's name, which to any ordinary reader would imply much the same thing. It certainly is out of keeping with the quotations we have made from the Whitley Report.

Parenthetically and anticipating the obvious reply that in practice the Employers' Associations did not in all cases nominate the members on the District Councils, we reply that this makes no difference. All it means is that the four Employers' Associations were willing for the sake of convenience that the choice of the actual names should be arranged locally, but they had always the right of intervening if they thought fit. We are rather surprised that the National Council, which set out its own list of members in the correct form, should have passed irregularities of this kind in the case of District Councils, involving as they do such a serious principle.

D

NEW DISTRICT RAILWAY ROLLING STOCK.

It will be remembered that at the new year we illustrated and described the first of the new rolling stock that is being delivered for service on the Metropolitan District Railway system.* The article, however, only dealt with the trailer cars, but we are now able to publish some details of the motor cars, which were subjected to a short demonstration run last week. The new steel rolling stock is built to conform in general appearance to that of the trailer cars described in the above-mentioned article, and is designed for working 8-car trains during the busy hours, and 5-car trains during the slack

Fig. 1.—New District Motor Car.

service periods. Each 8-car train consists of three motor and five trailer cars; the motor coaches are of higher power than their predecessors of the older stock, and this will increase running speed—the new trains being capable of attaining a speed of 45 m.p.h. on "non-stop" runs—and will also accelerate starting. Improved braking equipment has been adopted to secure more rapid, yet more even, stopping. These are all points of importance, as the problem of getting more trains through the tunnel sections depends not only on the time spent between stations or in station stops, but also upon the time occupied in the process of stopping and starting.

The general dimensions of the cars are: Length, 49 ft. 2 in. over headstocks; width, 9 ft. 6 3/16 in. over sole bars; height, 11 ft. 11.5 in. rail to roof; centres of bogies, 34 ft.; and wheel base centres, 7 ft. 10 in. (trailer bogies 7 ft. 3 in.). The total weights are: Motor car, 44 tons 10 cwt.; trailer car, 24 tons 10 cwt.; and control trailer car, 25 tons 16 cwt.

A train comprises eight cars of three types, viz.:—Motor, control trailer, and trailer cars, and the seating capacity of the trailer car is 48, that of the control trailer 44, and that of the motor car 40, the variation being due to the control and motor end compartments taking up a little space.

On the motor, fig. 1, and control trailer cars, in addition to the three double doors, single doors are fitted at the ends of the cars, and the latter ones will also be available for the use of passengers when not occupied by the operating staff of the train. An 8-car train of the new stock will give the equivalent of 52 single doors throughout its length for the use of passengers, which provision will reduce the time taken in loading and unloading at stations, and will thus accelerate the operation of individual trains and so enable more trains to be run.

* Electrical Review, December 31st, 1920, p. 838.

The interior fittings are generally similar to those of the trailer cars, and to ensure absence of vibration and drumming, the steelwork has been covered with canvas so that a maximum of quietness and sweet running is expected, which object will also be assisted by considerable attention having been given to the subject of car springing.

A new feature of interest to the travelling public is the provision of two sets of train indicators, one on either side of the centre doors, showing "non-stop" stations both in the east and west end of London.

The cars are equipped with Westinghouse brakes on the double block standard system, and provided with automatic adjustment for taking up any slackness. Calculating the cylinder pressure with full application at 50 lb. to the sq. in., and taking the leverage at 4.4 to 1, gives 39.6 tons total block pressure on the motor cars. The gauge pressure on the train line is 60, and that on the main line 70/85 lb. per sq. in. A hand brake is fitted to all motor cars and control trailers; main reservoirs are fitted to each motor car.

The underframes are constructed entirely of steel bulb angles untrussed, but cambered up to form the sole bars, and the centre longitudinals are rolled steel channel sections running the whole length of the frame between bogie centres. The extension to headstocks is made up of pressed-steel channel section. The cross bearers at the bogies are pressed channel sections tapering at the

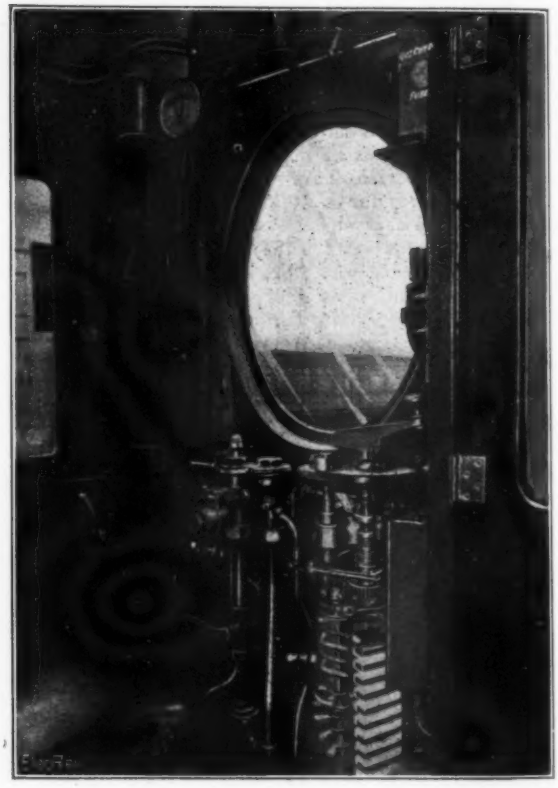


Fig. 2.—Interior of Driver's Cab.

sides with flanges stiffened above and below. The floor plates are stiffened with short angles and pressings across from the sole bars to the centre longitudinals, and the whole is stiffened up with four gusset plates between the bogie centres.

Each motor bogie is equipped with two motors hung on the axles and supported by brackets extending from the housing plates. The driving wheels are 36 in. in diameter. The motor bogie side frames are of channel section running the whole length to the headstocks, but are cut away on the bottom flange to receive the axle

boxes. The bolsters are built up of channels, and are supported on nests of concentric coil springs mounted on the spring plate, which is a channel pressing with the upper edge turned over to form a flange; this in turn is supported by heavy steel forgings pivoted to cast-iron brackets fastened to the housing plates.

The centre bearing is a ball bearing, and the journal boxes slide on horn plates of heavy cast steel, bearing on laminated centres composed of ten plates, eye bolts taking up the load through auxiliary rubber springs *via* steel eye-bolt brackets riveted to the side frame channels. The trailer bogies follow similar but lighter construction.

The motor cars are each equipped with four G.E.260 motors of the interpole tapped-field self-ventilated type, and are rated at 198 h.p. for one hour, and 182 amperes continuously. The motors are fitted with 20-tooth pinions gearing with 63-tooth gear wheels and provided with bolted type axle caps and dust shields for the axle, and the suspension bearing brasses are keyed to prevent rotation.

Each pair of motors with its control gear constitutes a complete unit equipment. The control gear (mounted under the car) consists of a circuit breaker, main switch, fuses, reverser, 15 contactors, resistances, and tapped-field relay. The contactors are of an improved type. The contact tips are provided with arcing horns and a moulded arc shoot, and the interlocks are of the disk type mounted on the back of the contactor. The contactor box with all contactors, resistances, &c., is a unit complete with wiring, and has its own terminal base. The reverser connected to the motor fields is of a drum type operated by a pair of opposed solenoid coils. Other apparatus is substantially the same as previously used.

Master controllers of an improved type are fitted at each end of each motor car, fig. 2, and at one end of the control trailer car, together with the necessary control and compressor switches, circuit-breaker, switch, fuses and control-cut-out switch; the control is non-automatic except that the motor field is weakened automatically by the tapped-field relay on the current decreasing on the last controller point in parallel.

The 8-car train has an acceleration of 1½ m.p.h. per second and a balancing speed of 45 m.p.h. attained after travelling one mile on the level. The time for a section 0.51 mile in length is eighty seconds excluding stops.

The stock was constructed by the Metropolitan Carriage, Wagon & Finance Co. at its works at Oldbury, Saltley.

CHIMNEY DRAUGHT TROUBLES.

By EDWARD INGHAM, A.M.I.Mech.E.

In order that the fuel in a boiler furnace may be burned to the best advantage, it is essential that there should be a good draught, since otherwise the amount of air passing through the furnace, and consequently the oxygen required for combustion, will be restricted, with the result that the fuel will be only partly consumed. Hence every steam user who wishes to avoid unnecessary waste of fuel must not only provide the required means of producing a good draught in the first instance, but must take care that the draught is maintained. Troubles in connection with draught are not by any means infrequent; in the majority of cases they are due to simple causes, and to find the remedy is, therefore, usually not a difficult matter. We shall in this article consider some common causes of bad draught, and incidentally refer to one or two troubles which are more or less the result of impaired draught.

The common method of producing a draught is to build a chimney of suitable height. The chimney contains a column of heated and rarefied gas, and the difference in weight of this column and that of a similar column of cold air outside causes the air to move, and so produces the draught. The draught will, of course, depend upon the height of the chimney, the temperature of the gases in the chimney, and the temperature of the outside air. It is useful to remember that when the temperature of the air is 62 deg. F., and that of the chimney gases 552 deg. F., a chimney 140 ft. high will produce a draught of one inch of water, which is ample for the burning of most fuels; in fact, many coals can be satisfactorily burned with a draught of ¾ in., so that from the draught point of view, a chimney considerably less in height than 140 ft. will be satisfactory in most cases. Chimney heights, however, are fixed more by the sanitary requirements of the neighbourhood than by the draught they will produce, because it is necessary that the products of combustion should be discharged at a height considerably above that of the surrounding buildings. In general, if the height is satisfactory from this point of view, it will usually be satisfactory with regard to the draught.

A rough rule for determining the height of the chimney required to produce a given draught is: $H = 137D$, where H is the height in feet, and D is the draught required in inches of water. When the height has been fixed, the next consideration is the sectional area of the chimney. This, of course, will depend upon the total grate area of the boilers as well as upon the height of the chimney; the following formula may be used:— $A = WG/14\sqrt{H}$, where W = the number of pounds of coal burned per square foot of fire-grate per hour; G = the total fire-grate area in square feet; and H = height of the chimney in feet, measured above the fire-grate. If there is only a single boiler, the constant may be increased to 1/12 or 1/10.

It will be obvious that the first thing to do when inquiring into the cause of a bad draught is to see that the height and the sectional area of the chimney are satisfactory, since otherwise constant trouble will be experienced. As already explained, it will seldom be found that the height of the chimney is at fault, but if so, the chimney can perhaps be built higher, or the draught assisted by means of a fan. If the chimney area is restricted, nothing can be done to enlarge the area, except by entire rebuilding, and some other means must, therefore, be adopted.

A bad draught is sometimes the result of installing one or more additional boilers, the sectional area of the chimney being insufficient to discharge freely the gases from the original and the new boilers combined. This will illustrate the importance of making the sectional area of a chimney of ample size in cases where future extensions are likely to be made.

We remember one instance where a very high chimney failed to produce a good draught. So far as the height was concerned, a chimney of only three-quarters of the actual height would have been ample. The chimney in question had a keen taper, being very much smaller at the top than at the base, and an expert who was called in to investigate the trouble suggested that by reducing the height the sectional area of the outlet would be considerably increased, because the diameter increased gradually towards the base, and the area varies not simply as the diameter, but as the square of the diameter. The suggestion was acted upon and the increased outlet area thus obtained proved to be sufficient, no further trouble being experienced.

When additional boilers are installed and the existing chimney is not large enough for the increased duty, there are two principal ways of meeting the difficulty: One is to install an induced-draught fan, driven either by an electric motor or a small steam engine, whichever

is the more convenient. The other is to divide the whole range of boilers into two equal sections, allowing the existing chimney to deal with one section, and building a new chimney, perhaps of steel for cheapness, to cope with the remaining boilers. Which of the two methods would be the better one would depend upon circumstances, and the matter would require careful consideration of all the conditions.

In some instances, trouble with the draught is the result of restriction in some part of the flues. As a general rule, no part of the flues should be less in sectional area than the throat of the chimney. In one instance, where the draught was so poor that the firemen could not keep up the steam pressure, it was found that the fire-bridges had been built too high, *i.e.*, to within about 9 in. of the top of the furnace crowns. The simple act of removing two courses of bricks entirely overcame the trouble.

Sudden bends and changes of section in the flues will sometimes be responsible for impaired draught. As far as practicable all bends should be smooth and of large radius, and the course of the flues to the chimney should be as direct as possible. When the chimney is at a great distance from the boilers, both it and the main flue should be made of considerably larger area than would be necessary in a normal case. For example, it is recommended that the area in the case of a main flue 1,000 ft. long should be twice as great as would be necessary in a case where the boilers and the chimney were close together, as determined by the ordinary rules.

We have seen that the draught produced by a chimney depends upon the temperature of the gases passing up the chimney. If from any cause this temperature should be reduced, the draught will be impaired, a fact which is commonly overlooked. Hence it is important that leakages of cold air into the flues should be carefully avoided, and to this end all the brickwork surrounding the boiler should be maintained in good order. Since there is reason to believe that a considerable quantity of cold air sometimes passes through the solid brickwork, owing to the porosity of the bricks, the coating over of the external surfaces of the walls with tar is worthy of consideration. It is not difficult to realise that when the brickwork either of the flues or the chimney is allowed to become defective, as it frequently is, particularly at the back end of Lancashire and similar boilers, the quantity of cold air rushing into the flues is so great that the hot gases are cooled down to such an extent that the draught may be entirely spoiled. We have in mind a peculiar instance of this.

At a certain works, a new boiler of the Lancashire type had been installed as a substitute for a similar boiler. Arrangements had been made for a number of influential shareholders to visit the works on the day of starting up the new boiler, and accordingly, the engineer-in-charge carried out a general "spring-cleaning." On lighting the fires in the new boiler, however, he found to his dismay that the chimney would not "draw," and the boiler house was soon filled with smoke. So far as was known, no change whatever in the conditions of working had taken place, and for the time being, those concerned were at a loss to know what to do. A careful examination of the brickwork setting showed the brickwork to be in good order, but on going to examine the chimney, the engineer-in-charge found a large fracture at the base of the chimney extending for several feet. Through this rent the cold air rushed in large volumes, cooling the chimney gases to such an extent that the draught was almost entirely spoiled. The fracture had existed previously, but had been covered up by dirt and refuse until the day in question, when the rubbish had been removed, thus revealing the defect. The rent was quickly made good, after which no further trouble was experienced.

The serious effects which the installation of a fuel economiser may have in impairing chimney draught are not always realised as they should be. Such an apparatus will generally extract so much heat from the products of combustion that the temperature of the gases is reduced about 300 deg. F. Since, as we have seen, the draught depends largely upon the temperature of the gases, it will be realised that such a reduction of temperature may entirely spoil the draught produced by a chimney which was originally designed on the assumption that there was to be no economiser. If, indeed, the outlet temperature of the gases is low to commence with, the installation of an economiser is out of the question. The economiser may also prove a serious obstruction in the flues unless care be taken to avoid this difficulty.

In starting up a boiler connected with a cold chimney, trouble in creating the draught is liable to be experienced for the obvious reason that, to commence with, the chimney contains a column of air at approximately the same temperature as that of the outside air, so that there is no difference in weight of the two columns to set the gases in motion. When this trouble is met with, it may generally be overcome by lighting a fire at the base of the chimney.

Trouble with the draught is sometimes experienced in hilly districts when the surrounding hills are in close proximity to the chimney. The difficulty is frequently in the nature of a down draught, and would appear to be brought about through the wind blowing downwards from the hills and descending the chimney shaft. Strangely enough, the trouble may only occur when the wind is blowing in a certain direction; there is a belief that when the wind is a northerly one, the trouble is far less liable to occur than when it is in any other direction, but why this should be so is not easy to explain.

A down draught is often attended with very unpleasant results. For instance, the smoke is blown into the boiler house, flames and sparks issue from the furnace mouths, and the boiler may vibrate more or less violently owing to the descending currents of cold air meeting the ascending currents of hot gas. A down draught will sometimes be caused by the choking of the spaces between the firebars. The flow of air upwards through the grate is checked, with the result that air flows downwards from the outside. This applies more particularly to vertical boilers, and the remedy is obvious.

In Lancashire boilers, a trouble closely akin to down or back draught is occasionally caused through the baffling of the two streams of gas as they issue from the flue tubes, and meet in the downtake; this trouble may be accompanied by the most violent vibration. The remedy is to prevent the two streams of gas mixing together until they have passed a distance of a few feet under the boiler towards the front end, by building a mid-feather wall.

Australian Industrial Developments.—A Beama Protest.—The "ydney correspondent of the *Daily Telegraph* reports that, speaking at the opening of Messrs. Chubbs's new safe works, Sir Joseph Cook referred to the growing tendency of British firms to establish factories in Australia. He said he was recently advised that it was proposed to spend £10,000,000 in new enterprises. Since last March, 22 important new undertakings had been registered, with an aggregate capital of £3,500,000, besides £1,500,000 in the wool and textile industries alone. Bearing on the same subject, "the Australian Overseas Committee of the British Electrical Manufacturers' Association has protested against the decision of the Sydney City Council to accept the tender of an Australian firm at a price 20 per cent. higher than that of British firms. The Association states that the duty, freight, insurance, exchange, and other charges afford Australian firms a protection of 45 per cent. Thus the total burden on British manufacturers in this instance is 65 per cent. It is urged that no preference should be given to local firms over British goods."

High-Speed Kinematograph.—A golfer's strokes were used by Dr. Gustave Monod, of Vichy, during a lecture he gave at the Royal Society of Medicine, on February 23rd, to demonstrate the "ultra-kinema," a French apparatus which Dr. Monod has brought with him from France. According to the *Daily Mail*, the film is made at the rate of 300 exposures per second, and the picture is thrown on to the screen at the rate of 16 to the second, showing the action, Dr. Monod explained, about 20 times more slowly than the speed at which it took place.

ELECTRICAL DECISIONS IN 1920—I.

The Law Reports for 1920 do not contain many cases relating directly to the supply of electricity. Either the lawyers have been too busy with other matters, or those connected with the industry have been careful enough, or fortunate enough, to keep out of the way of litigation.

There are, however, a few cases relating to tramways and other matters to which it is desirable to draw attention.

First with regard to tramways: those who run these vehicles in public streets seem to be fair game for claims for compensation for alleged personal injuries; though to people who have a due sense of proportion, the number of accidents which can possibly give a cause of action is extraordinarily small when compared with the number of persons carried.

Two cases have been decided, one in Ireland and the other in England, in which the duty of a conductor in relation to passengers was considered. In the Irish case (*Steele v. Belfast Corporation* (1920) 2 I.R. 125), an action for negligence was brought. The evidence for the plaintiff was to the effect that, while a tramcar was at a standstill at a compulsory stopping place, indicated by a red signal post, the plaintiff proceeded to enter, but just as she had put her foot on the step, a passenger on the platform rang the conductor's starting bell, and the driver put the car in motion, with the result that the plaintiff was thrown to the ground and sustained serious injuries; that during all this time the conductor was on the top of the car collecting fares, and that during the earlier part of the same journey the bell had been rung by passengers on at least three occasions. The fact that the Irish Court of Appeal held, on these facts, that the jury were entitled to find a verdict seems to indicate that according to the judges in Ireland a conductor is bound to prevent the misuse of the starting bell at all costs; but that this is not the view of English judges appears from *Wagner v. West Ham Corporation* (37 T.L.R. 86), where an attempt was made to make a tramway company liable for an accident to a passenger in somewhat unusual circumstances. When the plaintiff was entering a car of the defendants at an optional stopping place, the vehicle moved forward, with the result that the plaintiff was injured. It was shown that the starting bell was rung by someone other than the conductor. In these circumstances the Corporation was sued, it being asserted that the conductor was negligent. A County Court judge having found that there was no negligence, gave judgment for the Corporation, and his decision was affirmed by two judges of the King's Bench Division, who laid it down that the mere fact that a tramway car has been started from an optional stopping place through the bell being rung by a passenger in the absence of the conductor does not render the tramway owners responsible for injury thereby occasioned, unless it is shown that in the circumstances the non-control of the bell by the conductor amounted to negligence. This decision accords with common sense. A conductor has many functions to perform besides watching the ingress and egress of passengers, and in the absence of negligence his employers ought not to be held responsible.

Apart from those who suffer actual physical injury, people whose nerves are affected sometimes attempt to recover damages from tramway authorities. Thus in a Scotch case, *Ross v. Glasgow Corporation* (1919 S.C. 171) a lady averred that she was occupying a front seat on the top of an east-bound car, which was standing 30 feet from a set of points; that she saw the driver of a west-bound car, which was standing on the same line of rails, but on the other side of the points, start his car without changing the points, and drive at considerable speed towards her car, stopping only at a distance of 3 feet from it; and that, through fear of a collision, she sustained a nervous shock which resulted in permanent injury to her health. It was held that such a serious fright as that alleged was not a natural and probable consequence of the occurrence, and the action was dismissed as irrelevant. It will be observed that the action was dismissed not because the claim was for damages for nervous shock, but because, in the opinion of the Court, the shock was not the necessary result of the accident. Claims for mere shock have more than once been held good—at any rate in English courts.

In the case of the *Postmaster General v. Blackpool and Fleetwood Tramroad Co., Ltd.* ((1920) 37 T.L.R. 20), the Postmaster-General sought to recover damages from the defendant company, alleging that certain telegraph cables which he had laid near their tramline had been injured by electrolytic corrosion. He was held entitled to recover, notwithstanding that the tramline had been constructed by the defendants under their powers in 1898, and the lines of the Postmaster-General were not laid until 1914. This remarkable decision requires some explanation. The company were bound by S. 65 (1) of their private Act (Blackpool and Fleetwood Tramroad Act, 1896) to work their undertaking in all respects with due regard to the telegraphic lines from time to time used by the Postmaster-General and the currents in such telegraphic lines; and "Shall use every reasonable means in the construction of their electric lines . . . to prevent injurious affection." S. 65 (2) imposes upon the company an obligation to pay the expense of all such alterations in the telegraphic lines of the Postmaster-General as may be necessary to remedy injurious affection. It appeared that the telegraphic line was laid in 1914 within 7 feet of the company's electric lines, and without any notice to the tramway company. A breakdown, which occurred in 1916, was found to be due to corrosion, and the difficulty was overcome by bonding. A County Court judge before whom the case came in the first instance, held that the Postmaster-General, in order to succeed, was bound to show that the company had failed to lay their cables in the proper way, and that, as he had failed to do this, the company could not be blamed. The Court of Appeal, however, held that this argument was untenable. Counsel for the company then attempted to argue that as the Postmaster-General had been negligent in laying his telegraphic cable so near to the tramway cables, the company could not be held responsible. The Court of Appeal refused to allow this point to be raised, as it had not been taken before the County Court judge. They made it quite plain, however, that this was a defence which might have been put forward, and the fact that they did so is a matter which ought to be borne in mind by tramway and other companies who have claims for "injurious affection" preferred against them by the Postmaster-General.

SUPPLY LEGISLATION IN HOLLAND.

The question of the creation of a public authority in Holland for the concentration of the generation and transmission of electricity, to which reference was made in this journal about a year ago, has not yet been settled, although a somewhat modified Bill is at present receiving the consideration of the Second Chamber of the States-General. This Bill has for several months past been under the examination of a departmental committee, some of the members of which have raised objections to the scheme. In their opinion, the adoption of the project would not promote the supply of electricity throughout the country, but would hinder it, as the existing central stations would be hampered in their development on the measure becoming law. On the other hand, the Minister of Public Works, in the course of a lengthy reply to the objections in general, states that the fact is overlooked that the greater part of the country—in eight of the eleven provinces—is already supplied, and will continue to be supplied to a large extent in the near future, according to concessions granted by the Crown; and it is intended to issue concessions to provinces and communes in the remainder of the country. It is calculated that the scheme will permit of the delivery of electricity to consumers at a lower price than would otherwise be possible. But although the Minister expects great advantages to result from the centralisation of production, or at least from the use of large sets, he expresses the opinion that the importance of the proposed regulation of the industry lies less in the circumstance that it would render this concentration possible than in the advan-

tage which it will confer on the country by the production and transmission of electricity at high pressure.

The Minister proceeds to state that with the exception of a few central stations all the electricity supply works are in the possession of the provincial and communal authorities. In so far as the bringing into operation of the scheme will cause any change for these bodies, it is that they will be relieved in the first place by the State (the public authority as a company) taking over the central stations and high-pressure network, and secondly, new generating stations and high-pressure networks which appear necessary will be established by the State, and not by the provinces or communes. In general, the centralisation will not proceed further than the production and transmission at high pressure, and will, except in special cases, not extend to the distribution of electricity. As to the purchase price to be paid for works, it is impossible to agree that more shall be paid than the value of the plant for the carrying on of the business. Proposals exist for the conversion to electric traction of certain of the railways which have to deal with a large volume of traffic, and in this connection the committee has reported that the source of production and distribution of energy for this purpose is independent of the system to be adopted for the working of the railways.

According to the alterations made in the original Bill, the public authority (company) to be formed bears the title of the Nederlandsch Electriciteits Bedrijf. The object is to establish and work stations for the production of electricity which is to be placed at the disposal of other parties, the transmission of the power by primary high-pressure mains and its transformation in sub-stations connected directly with the primary network; in special cases also to establish and carry on distributing works according to concessions to be granted by the Crown, and to purchase and take over generating works and equipment, as well as to buy energy in so far as may be necessary. Authority is conferred upon the company to take every action in accordance with the foregoing objects or which is connected with them to the fullest extent, even if this implies participation in other undertakings. The company is forbidden to dispose of the whole or part of any works or rights acquired, without the consent of the Minister of Public Works, and the sanction of the latter is also required to the raising of loans and the conclusion of important contracts for the sale or purchase of energy, the Electricity Board being heard before the Minister decides what are important contracts.

The company, which is to be formed for a period of 99 years dating from the Royal approval of the law, will have an ordinary share capital of 15,000,000 fl. divided into 100 shares of 150,000 fl. each. It is further provided that both consumers and workmen shall be represented on the Electricity Board, which will be established under the law to act as an advisory council to the Minister of Public Works.

JOINT ELECTRICITY AUTHORITIES.

The Chester and North Wales Inquiry.

(*Continued from p. 236.*)

Continuing the cross-examination of Mr. S. E. Britton on February 14th, Mr. Jones closely questioned the witness as to figures given in the scheme which showed discrepancies, and an adjournment was granted for the town clerk of Chester to go into the matter; on resuming, the latter stated that owing to the hurry of the revision of the scheme certain figures were put in which were inaccurate, and the total should read £29,800 instead of £35,850 in regard to the cost of transmission lines. Questioned as to the Vale of Clwyd scheme, the witness stated it was proposed to put a dam across the river Clwyd and construct two channels across the river Elwy; the cost of £65,000 included £18,000 for cable, and it was proposed to submerge 28 acres of land which would cost about £4,600, and include water rights and compensation. The dam would be about 40 to 50 ft. high, and be made of stone. The dam would form a lake about a mile long and half a mile wide; the flow of the Elwy had been measured up to 14,000 cu. ft. a minute.

Mr. Jones: What I want to know is how are you going to construct a lake of that size on 28 acres of land?

Mr. Britton: I have not got the figures here; of course I have overstated it, a square mile is over 400 acres, and obviously that is wrong.

Mr. Jones: I am very concerned as to whether these figures you are putting before the Commissioners are really reliable.

Mr. Tyldesley Jones, in concluding his cross-examination, said he reserved for a later time some points in the clauses containing obligations which had been put there for the supply of railways, and if the order went any further he would ask for it to be materially extended, because it was limited to haulage on the railways.

The witness was then cross-examined by Mr. Moon, for the Dee Fisheries Board, who questioned the witness as to his report to the Board of Agriculture, in which he stated: "The Dee was prominent among British rivers for the cultivation of salmon, and in utilising the river for the generation of electricity special attention should be given to fishing interests."

In reply to further questions, the witness stated they had no intention of taking off the foot from the weir put on under the Defence of the Realm Act. He also said he had seen salmon use the "fish pass."

Witness said it was proposed to construct two new weirs at first; eight in all were to be constructed, but at what period he could not say. Since the first proposal was made four of the proposed dams had been cut out, reducing the 50,000,000 units. He estimated that up to 60,000 cu. ft. per minute would pass through the turbine intake at full load.

Mr. Bruce cross-examined witness as to the Vale of Clwyd scheme and the proposal to erect a dam on the Elwy, and the chairman remarked that before a hydro-electric station could be constructed the Commissioners would see that proper notices would be given to the authorities concerned, and any important interests such as the Fisheries would be fully consulted.

Mr. A. E. Morris, cross-examining on behalf of the Carnarvon C.C., asked "If no public authorities, say, in Carnarvonshire came into your scheme owing to the financial responsibilities which clause 78 puts upon them, where do you hope to get that money to develop or to make transmission lines during the first five years?

Mr. Britton: The Joint Electricity Authority must have powers to raise the money, otherwise it could not operate, and it would raise money under such powers.

Sir Harry Haward: Is it the intention that the Joint Electricity Authority should not construct any works in the area of a district, the urban or rural council of which declines to become a constituent authority?

Mr. Britton: No. I do not think that is the idea. I do not think it restricts itself to the areas of authorities who have undertaken financial responsibility only. I think it must operate in the whole area.

Sir Harry Haward: Then there will be advantages to be gained by consumers in areas the councils of which do not become constituent authorities, and the money for carrying out those works would be raised on the security of the whole of the district which is represented on the Joint Electricity Authority.

Cross-examined by Mr. Walter Jones (Anglesey C.C.), witness said that the resources of the Power Co. as regards the western area were the primary and only source, and that the areas in that district should have preferential appropriation of an adequate development to the local and national advantage.

Mr. H. S. K. Feltham (town clerk of Crewe) then cross-examined the witness as to what the scheme intended to do for Crewe.

The town clerk of Chester, before the adjournment for the day, asked for the production by the Power Co. of details so as to show the financial result year by year, including capital charges and revenue, up to 1925.

There was again a large attendance when the inquiry re-opened on Friday, February 18th. At the outset the chairman asked Mr. Dickson, the town clerk of Chester, whether the statement showing the approximate composition of the Joint Electricity Authority as promised by him was yet prepared.

Mr. Dickson expressed regret that it was not ready, and put in a statement showing how the £27.5 per kW capacity of the steam generating station was arrived at, the figures given being the estimates of the contractors. The figures given under wages, stores and repairs, and rents, rates, and taxes, management and establishment charges, had been altered, the total being £28,875.

Sir John Snell remarked that the Commissioners were getting rather concerned as to the length of the inquiry. All who desired to cross-examine the witnesses should avoid repetition.

Mr. Feltham (town clerk of Crewe) continued his cross-examination of Mr. Britton. Mr. Feltham said there were something like 20 generating stations in the area at present; would it be more economical if they were to be extended or for the scheme to go through?

Mr. Britton: I think it is essential that the scheme should go through.

Cross-examined by Mr. Allen (Denbigh C.C.), he said it was absolutely essential for industrial purposes that a constant supply of energy should be maintained, especially with respect to the water in some of the mines.

Asked whether he proposed to charge the same price for industrial purposes as for lighting purposes, Mr. Britton said a Joint Electricity Authority would not provide tariffs for lighting only; it would provide tariffs to supply authorised distributors and large consumers. The price to the authorised distributors mentioned on Thursday, about 1½d., was merely an average figure.

Mr. Allen: Do you know that energy is supplied to the collieries in Lancashire at under 1d. per unit?

Mr. Britton: I do not know that. In answer to the chairman, the witness said that taking the load factor into account, it should be possible to get a figure of under 1d. per unit. Asked by Mr. Allen whether the enlargement of the existing Wrexham station or the erection of a generating station in the heart of a coalfield would give greater confidence to the industries of the district rather than the water power scheme, Mr. Britton said No. The proper place to put the steam station was on the Dee, having regard to the volume

of water available for condensing purposes. It was proposed to erect the transmission lines overhead.

In answer to Mr. Cowley (Northwich U.D.C.), the witness said the promoters of the scheme could give no assurance when the scheme would be carried out; it was a matter for the Commissioners and the Joint Electricity Authority.

Mr. Cowley: Suppose the whole of the urban authorities within a defined area could not see their way to come within the scheme, to become, as it were, constituent authorities in the scheme, it would be difficult to work the scheme.

Mr. Britton: If they took the line you suggest they would be neglecting their duty under the new Act.

In answer to Mr. Fennell (Northwich Electricity Supply Co.), the witness said that he had not had any further information to enable him to form an opinion as to whether the Dee water power or the Welsh water power would be the best in the central and eastern areas.

Mr. Amos Jones (Rhyl U.D.C.): Have you applications from anyone in the district for energy

Mr. Britton: It has not been part of our work to do that.

Mr. Jones: The facts establish that only 356,000 units were consumed by Rhyl, but you put forward a proposal that 3,000,000 units will be taken in the next ten years. Rhyl is the only town in the area that at present consumes electricity.

The Chairman: May not that be because your cost of production is so high?

Mr. Jones pointed out that there was a belief prevailing amongst various undertakers that should they refuse to participate in any scheme that might be set up, the Commissioners in whom the power of sanctioning loans was now vested would refuse them any expenditure upon their undertaking until such time as they agreed to come within the scheme.

The Chairman: For the benefit of those who have got that mistaken idea, I might perhaps say at once that I am quite sure that it would not be the attitude of the Commissioners. If after the establishment of a Joint Electricity Authority there is a particular undertaker in the district whose undertaking can be extended at a cheaper rate, and with a greater benefit to the people in the area than the alternative course of taking it from some distant supply, I am perfectly certain the Commissioners under those circumstances would not refuse to sanction the extension of that undertaker's station, taking, of course, all the necessary points into consideration.

Cross-examined by Mr. H. J. Owen (Merioneth County Council), the witness said he was aware that Merionethshire was anxious to obtain an adequate supply at an early date, subject to some form of public control, and that Merioneth was within the area of the North Wales Power Co.

Mr. Owen: Why has Merioneth been left out of your scheme?

Mr. Britton: It is stated that so far as Merioneth and Montgomery are concerned it should be the first duty of a Joint Electricity Authority thoroughly to survey those areas, and find out the sources available for development.

Mr. Owen: I take it the whole area will benefit by the erection of a station at Maentwrog, and that you will admit the resources of Merionethshire are being made available and diverted to services outside the county?

Mr. Britton: Well, the county generally, as far as practicable.

The witness was then cross-examined by Mr. Leigh (Flintshire County Council) concerning the figures given for the cost per mile of the transmission lines, and the route of the line.

Sir Harry Haward: What figures ought I to take for the purposes of comparison with the generating costs of existing stations in order to show whether it would pay the authorised undertakers to take a bulk supply from your new station?

Mr. Britton: The figure is 1.135d. including transmission; at Northwich the figure is 1.161d.

Sir Harry Haward: It is not clear that the whole of those costs would be saved if Northwich took a supply in bulk, and there would be certain wages still to be paid, so that the generating costs of Northwich were something less than 1.161d.

Mr. Britton: That would be so.

Sir Harry Haward: Could you afford to supply Northwich at a figure which would induce them to take your supply?

Mr. Britton: Not on the average cost per unit.

The witness, in reply to further questions, said he was expecting 20 existing stations to be discarded on the assumption that a supply would be available at a cost below their present cost.

In reply to Mr. Page, the witness said he had not been able, through lack of information, to come to any conclusion as to what would be the diversity factor in the event of the stations being supplied from a common source. He agreed that if any other source or method of supplying electricity could be shown to be economical, the low-fall water power should remain in abeyance until some future time.

In arriving at the figure of 2d. per unit he had assumed the calorific value of the fuel at 11,000 B.th.u.

Mr. Page: What would be the ratio between steam supplied load and water supplied load in a total load of 10,000 kW?

Mr. Britton: I should think anything between 30 and 50 per cent. would be ample.

In reply to further questions as to the many steps between the turbine and consumer on the proposed low-fall water-power development, the witness said it was proposed to adopt the Thury system, which he considered was the most suitable.

Mr. Page: Have you considered the Highfield method? Perhaps you do not know of that—it is quite recent; it is a new type of, shall we call it, "converter."

The Chairman: Supposing, when the details of the Power Co.'s scheme are unfolded, that it be found that energy can be supplied by them into the eastern district more cheaply than you estimate you can generate from a steam station on the Dee, in spite of what you have said, do you seriously, as an engineer, say that it would not be better and the more proper thing to take the energy from the Power Co.'s district for use in the eastern districts rather than incur the expense of a scheme on the Dee Estuary?

Mr. Britton: I quite agree, sir; if, as you say, such a result can be shown it would be quite the proper thing to develop in the west and leave the other development.

The witness also agreed that with reasonable duplication there would not be any real difficulty in maintaining intact a properly designed system of transmission.

Before Mr. Britton left the witness chair, which he had occupied for nine hours, the chairman remarked that the Commissioners recognised that he had done valuable pioneer work in connection with the matter, and they wished to thank him and his colleagues for it.

The next witness called was Mr. W. H. Armistead, a consulting fish culturist. He said that the dams to be constructed would cease to be an obstruction to salmon if suitable fish passes were constructed.

Lieut.-Col. W. A. Churton, deputy chairman of the Chester City Council Electricity Committee, gave evidence, and was followed by Sir Henry Robertson, chairman of the Dee Fishery Board, who stated that with the formation of the lagoons pike would congregate and destroy the salmon fry. He estimated the value of the salmon caught yearly in the river at £10,000.

In answer to Mr. Allen, the witness stated that his company, the Brymbo Steel Co., generated and consumed 5,000,000 units of electricity a year. In answer to Mr. Miller, he said that they were prepared to purchase energy from the North Wales Power Co. if it were offered at a price which would pay them to buy it—say, in the neighbourhood of ¼d. a unit.

Mr. Moon (Dee Fishery Board) addressed the Commissioners, asking them to reject the scheme on the ground that the proposal involved compulsory powers, which ought not to have been included. His Board also took the view that if there was an urgent demand for electricity in the district there was obviously an alternative supply which should be considered, and the scheme, as far as concerned the water portions of it, was completely irrelevant and could have no force whatever.

Mr. Bruce then made a statement on behalf of the Ministry of Agriculture and Fisheries, and said it was the considered opinion of the Board that the fisheries would be not absolutely ruined, but next door to it. The fishery interests would be prepared to stand aside in the common interest if this were necessary, but the alternative scheme did not affect the fisheries in the least.

The North Wales Power Co.'s Scheme.

Mr. Miller was then called upon to open the case for the North Wales Power & Traction Co.'s scheme (abstracted in the Electrical Review of February 11th). He said that the basis of the scheme was the proper development of the high-level water power of the western area: they wanted to develop that power, and they could do it to everybody's advantage. In 1903 the company was formed, and in 1904 it applied for Parliamentary powers, and in due course received them. The company was constituted for the purposes of the Act undertakers in the counties of Carnarvon, Denbigh (exclusive of the borough of Wrexham and the rural district of Wrexham), Merioneth, and Anglesey. By Section 9 of the Act there were transferred to the company powers with respect to generating and supplying electricity which had previously been vested in the Portmadoc, Beddgelert, and South Snowdon Railway Co., which had acquired those powers under an earlier Act of 1901. The company proceeded to carry on the work at Cwm Dyli, and got transmission lines, he thought, to Blaenau Festiniog, and to Llanberis, in connection with that station. In 1907 the first Aluminium Corporation came into existence; in 1909 the present Aluminium Corporation was formed with strong financial backing, and took over the business of the 1907 Corporation, which had in its own day taken over from the North Wales Power Co., the watershed known as the Ergian Watershed, now in use and developed at the Dolgarrog Power station. The Aluminium Corporation at once proceeded to develop the important water power in the Llewelyn Range, and its power station was at Dolgarrog in the Vale of Conway.

In 1916 the Corporation, in conjunction with the Conway and Colwyn Bay Joint Water Supply Board, obtained a special Act under which the Corporation was given authority to enlarge and extend Lake Cowlyd and to have the use of the lake after the necessary water supply had gone to the Board.

In answer to the Chairman, Mr. Miller said that the North Wales Power Co. was the statutory company carrying on under the Act the business of supplying power, and the Aluminium Corporation since 1918 had worked with it under one chairman,

Mr. Kenneth M. Clarke and the same managing director, Mr. Jack; all the directors of the North Wales Power Company had seats on the board of the Aluminium Corporation. There were additional directors of the latter who supported the present scheme. The North Wales Power Company owned the Cwm Dyli power station and the transmission lines of the company, and the Aluminium Corporation constructed the Dolgarrog power stations. The two stations were now linked up and a transmission line passed from Dolgarrog to Cwm Dyli. The business of supply took place from Cwm Dyli.

Mr. Howell (Town Clerk of Wolverhampton) said he appeared for the authorised undertakers for the North-West Midlands areas, which comprises the Midland Electric Corporation for Power Distribution, the Corporations of Stoke-on-Trent, West Bromwich, Shrewsbury, Leek, Newcastle-under-Lyme, Wolverhampton, and Market Drayton Electric Light and Power Company; the area as provisionally determined by the Commissioners in the county of Chester, the municipal borough of Congleton, Macclesfield, and the urban districts of Alsager, Bollington, Buglawton, Sandbach, and the rural districts of Yeardsley, Congleton, Disley and Macclesfield; in the county of Derby, New Mills and Hayfield. Those were areas roughly in the north and north-west which the conference wished to be excluded from the district as provisionally determined by the Commissioners, and if those areas were to be excluded they must be placed in districts which the Commissioners were now considering.

Mr. S. T. Allen (Wolverhampton electrical engineer and chairman of the Engineers' Committee representing the West Midlands district) gave evidence in support of the application, and stated the distances of the places they asked to be excluded from the stations they proposed to construct, one at Ironbridge, on the Severn, with a capacity of 150,000 kW and another near Rugeley, on the Trent, of 80,000 kW, and a third at Stoke, on the Trent, of 30,000 kW.

Mr. Allen was cross-examined by several representatives of adjacent authorities, and Mr. Proctor, for the promoters of Scheme A, said he had no objection to the areas being included in his scheme.

The Chairman said they would have due regard to the representation made by the North-West Midlands authorities.

On Saturday, resuming his statement on behalf of the North Wales Power Co.'s scheme, Mr. A. T. Miller, K.C., said to make the best use of the hydraulic power at the disposal of the Power Co. it was essential that the company should have a market in the industrial area on each side of the eastern border of Wales, and during the next ten years, which would form the interim period of development, it was proposed to supply energy at 1¼d. a unit average price, and when the development reached maturity this figure would be very considerable reduced. The erection of the transmission lines would be proceeded with as soon as the necessary powers were obtained or reasonably in sight. With the approval of the Commissioners these powers would be asked for by means of a Bill before Parliament.

Counsel went on to refer to various objections raised against the Power Co.'s scheme. One objection was that if the scheme were approved, there would not be sufficient public control over the undertaking. He would have thought that the appointment of the Electricity Commissioners themselves would to a very great extent meet such an objection as that, but the promoters were most anxious in every way to meet reasonable criticisms or objections, and they proposed to provide for the formation of an advisory committee of the consumers, including representatives of the distributors, the railway companies, and the large consumers. This committee could consider all complaints and advise as to proposed extensions of mains and so forth, and could make representations to the Electricity Commissioners, whose quasi-compulsory powers would be sufficient to secure attention to any reasonable requirements.

The objection that this private company might extort unreasonable profits from the consumers was met by clauses in the Power Company's Act limiting the profits to 10 per cent., and limitations as to the prices to be charged. The company was subject to a Board of Trade audit already. As to the suggestion that the Electricity Act contemplated administration by public authorities, Mr. Miller pointed out that the provision for the setting-up of a Joint Electricity Authority in the Act was to be acted upon where necessary, and he submitted that such a body was not necessary in this district, and would, owing to the exceptional character of the district, be undesirable.

The "deficiency clause" was put in to enable the company to pay the debenture interest in the event of the income from power sold not being sufficient to do so. Should another war break out, or some unforeseen dislocation of trade conditions arise which would embarrass the company—which would, owing to the nature of its business, have to make contracts ahead for many years—the clause would enable it to make up any deficiency of the debenture interest by a call upon the consumers in respect of the preceding year; or, if preferred, it could be made in the form of an increase of price for the coming years. The promoters were quite willing that the operation of the clause should be rendered subject to the approval of the Commissioners.

Mr. H. J. Jack, managing director of the Power Co., gave evidence. He explained the various works, and indicated the various watersheds by exhibiting a model on which the mountain ranges and valleys were shown to scale. He said that the heaviest rainfall was on the Snowdon area, which caught the rain clouds coming in from the Atlantic, and the lowest at the western side. In addition to the existing resources the company proposed to construct a dam near Maentwrog, which would give an enormous storage, and there were many further plans for increasing the supply of hydraulic power. It was proposed that the North Wales Power Co. should take £250,000 of the debenture issue of the Aluminium Corporation, and should finance the corporation to the extent of another £250,000, and in consideration the corporation would agree to give the Power Co. as much or as little electrical energy as the Power Co. might desire from year to year at the rate of ¼d. per unit.

It was at first intended that the companies should be merged, but that proposal bristled with difficulties, and this solution was worked out as the simplest way of dealing with the problem. A considerable amount of further capital would be required, and he thought that by issuing a bond that was certain to obtain its interest at a reasonable rate the money could be obtained from the public. Through his experience of the transmission of electricity by overhead mains he found that the system worked effectively and was extremely satisfactory, as he thought the company's customers would testify. The longest transmission line was that to Trevor, in South Carnarvonshire, a distance of 26 miles.

The witness was questioned by Mr. Dickson (Chester Corporation) as to the terms of the agreement with the Aluminium Corporation. The agreement, Mr. Jack explained, had not been drawn up, but, at the suggestion of the chairman, he promised to give the heads of it at the resumed sitting of the Commission.

Mr. Booth, a Commissioner, drew attention to a clause in the Power Co.'s Act, under which the company was required, on being served with notice to supply energy to a district, to deliver that energy at a specified point within that district.

In reply to Mr. T. E. Morris (Carnarvonshire County Council), Mr. Jack declined to commit himself to the principle of giving preferential treatment to consumers who were near the power stations in the matter of price. To Mr. J. Amphlett (Colwyn Bay),) who supported the Power Co.'s scheme generally, Mr. Jack said he would not object to some clause being inserted in the proposed Act under which, if the Power Co. at any time found itself unable to carry out its obligations, the proposed advisory committee would carry on the works. In fact, at the back of his mind was the thought that the advisory committee would, when it had learnt its business, become the Joint Authority for the area.

At this stage the Commission adjourned till Monday.

(To be concluded.)

NOTES FROM CANADA.

(FROM OUR SPECIAL CORRESPONDENT.)

Some months ago the Provincial Government of Ontario appointed a special committee to report on the possibility of devising a more equitable system of distribution of power by the Hydro-Electric Power Commission and a more uniform price. The former question was raised apparently by the rural portions of the province, where the people evidently feel that the cities and towns are getting all the benefits of cheap power while they themselves are left out except in those cases where the transmission and distribution lines pass sufficiently near to the hamlets and the farms to make it practicable to supply them; the latter question no doubt emanated both from rural districts and from small towns and villages, where it has been found possible to give a supply of electric energy, but only at high rates, owing to the smallness of the demand or to the remoteness of the particular town, &c., from the source of supply.

It is believed that this latter question was the one which was actually responsible for the appointment of a committee as, for some time, there has been an agitation in certain quarters that there should be one uniform rate throughout all the Commission's systems for electric energy, no matter how close to or remote from the source of supply any spot might be.

The committee referred to have just issued their report, which is unfavourable to the proposed "flat" rate for the entire province, but advocates a "zone" system instead, the rates to be uniform throughout any particular zone, of course.

Several other matters are dealt with in the report, which may be of interest.

The committee recommend the creation of a "Department of Power," to be a department of the Provisional Government with a "Minister of Power" at its head; they also recommend that a yearly rental for all power developed be charged at the rate of $2.00 per h.p., which would yield about $2,000,000. The report points out that of about 337,000 h.p. being supplied by the Hydro-Electric Power Commission, only about 2,500 h.p. is supplied to the agricultural industry; this being the case, the committee recommend that the Government should give financial assistance to rural districts by paying a certain proportion of the cost per h.p. supplied to such districts, the small and more remote municipalities

should also, it is stated, receive some measure of assistance, and suggested figures are given.

For power costing more than $30.00 per h.p.-year for any municipality or power zone, the Government should assist to the extent of 50 per cent. of the excess over $30.00 up to a maximum figure (for the Government) of $25.00.

For power supplied to the agricultural industries, the assistance given may amount to "a sum sufficient to meet 80 per cent. of the annual charge necessary to pay for the cost of building and maintaining in rural districts the low-pressure transmission lines that are necessary for rural distribution, but that such assistance shall not exceed 50 per cent. of the revenue derived from power rentals, and that one of the conditions upon which such assistance may be given is that there must be an average of three services per mile of transmission line in all rural districts served."

It will be very interesting to note whether these proposals are acted upon, as they will form something of a new departure in electricity supply even in connection with public ownership. That there will be strong opposition to some of them is certain. The consideration of such questions is explained by the fact that Ontario at present has a "Farmers'" Government in power.

In December the Hydro-Electric Power Commission put into operation two sets of 12,500 h.p. each at the power site developed at Nipigon, near Port Arthur, which is at the Western end of Lake Superior, and about 800 miles N.W. of Toronto. At present there is a temporary dam which gives only about half the head which will be available when the permanent dam is completed so that the power now obtainable is only about 12,500 h.p. Altogether about 75,000 h.p. can be developed at Nipigon when the local demands warrant it. Power is being supplied now to Port Arthur, and in time large pulp and paper interests as well as the City of Fort William will be using power developed on the Nipigon river.

According to a recent article in the *Canadian Engineer*, the Union of Municipalities, in the Province of Quebec (the stronghold of private enterprise so far as electrical engineering in Canada is concerned), is urging that the question of the development of water power by the Government receive consideration. Up to the present time the Provincial Government in Quebec, through the agency of the Quebec Streams Commission, has attended to the proper regulation and storage of water powers leaving actual development of water-power sites to private undertakings. If the proposals of the Union of Municipalities be adopted it will mean a very decided change of policy.

Extensions totalling approximately 130,000 h.p. are said to be in progress at several of the large hydro-electric plants in Quebec Province, and a new project for a 150,000-h.p. development on the St. Maurice river is being considered; in addition a number of smaller schemes are proposed.

As already reported in these Notes, there is a Power Commission in Nova Scotia, and though the available water powers are not very large when compared with others in this country, a 15,000-h.p. hydro-electric development is under construction which will probably be supplying power in the near future.

In New Brunswick there is a Hydro-Electric Power Commission which, however, has not been in existence very long, but which seems already to be making headway.

There is a considerable amount of activity in the Prairie Provinces, more especially with regard to the transmission of power developed on the Winnipeg river, in Manitoba.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Domestic Supply from 500-volt Generators.

I have two 500-volt, 150-amp. d.c. generators running in parallel and supplying lighting and power on the two-wire system. It is desired to obtain a lower pressure for domestic purposes, preferably 120 to 150 volts. The machines have each one positive and one negative set of brushes.

It would be very interesting to have criticisms of the practicability of obtaining this reduced pressure by fitting another set of brushes at some position between the existing brushes, whose potential will be that required, viz., 120 to 150 volts.

Further, what are the disadvantages or alternatives to converting to a 3-wire system and using the 250 volts for the above-mentioned purposes, and so limiting the pressure to earth to the safer figure of 250 volts?

Inquirer.

February 25th, 1921.

Charging Batteries for Motor Cars.

We have been interested in the correspondence in your columns which has been going on for several weeks under the above heading. As up to the present discussion has been confined to d.c. circuits we have not intervened.

Mr. D. V. Tustain's letter, however, in your issue of February 18th deals with the question of battery charging from a.c. mains. We have recently placed on the market the Tungar battery charger for this purpose, and a large number of types and sizes are available, suitable for all a.c. circuits in this country, and of capacities to suit most requirements.

The Tungar battery charger was illustrated and described in the electrical Press recently. The smallest size has an output of 2 amps. at 7.5/15 volts, and the largest 12 amps. at 0/75 volts. The efficiency of the larger size on full load is in the neighbourhood of 75 per cent.

A large number of Tungars are in use and giving every satisfaction, and we shall be pleased to give full data and information to any of your readers who may be interested.

J. W. Stephens,
Manager, Wiring Supplies Sales.
The British Thomson-Houston Co., Ltd.

London.
February 25th, 1921.

A Post Office Error.

Supplementing our advertisements by the sending of price lists, accompanied by letters in imitation typewriting, handed over the Post Office counter in batches in accordance with regulations, we have been surprised and annoyed to find a considerable number come back, due to the addressees not wishing to pay surcharges, amounting in some cases to 3d.

Inquiry at the receiving Post Office has made it clear that they failed to attach the triangular cancelling stamp to the envelopes that denotes the acceptance of the packet at the proper reduced rate, and so we fear many of our prospective customers have been unjustly mulcted of hard-earned money.

The object of this letter is to ask you to make the necessity of the triangular stamping more widely known, and to get back from the addressees the envelopes with the overcharge stamping, so that we may obtain the refund which we will make to them.

Photector Co., Ltd.

Southall.
February 26th, 1921.

Wiring in Ferro-concrete Factories.

Having had considerable experience in this class of construction, my few remarks may help "Inquirer." In the U.S.A., where ferro-concrete buildings are almost the rule in large cities, there is one generally accepted form of electrical installation, this being screwed steel tubing of the Sherardised or galvanised variety. The mode of procedure is as follows: The owner or architect engages an electrical engineer to prepare a complete wiring plan, showing light and power outlets or points, and sizes of conduits, with the number and size of wires they are to contain. Tenders are invited and accepted on this plan. As the building of the wooden forms proceeds the electrician installs the tubing system according to the engineer's plan. The concrete is then poured, completely embedding the tubing. When the building is practically finished, the wires are drawn in. Very few draw-in boxes are used, the lighting outlet boxes and distribution boxes generally proving sufficient for this purpose. Personally, I do not think this system can be improved upon, for this class of building, provided that the owner or architect knows what he wants beforehand, and the services of a capable engineer are engaged.

P. Davis.

Portsmouth.
February 28th, 1921.

With regard to the use of a concentric wiring system, the writer had the opportunity of viewing some premises in which a fire had taken place—through no fault of the electrical installation—and the only material left on the wall was the copper-covered wires put up ten years ago and manufactured by Siemens Bros. The rubber had doubtless perished inside the copper tube, but had the wires been sunk in concrete there would have been a possibility of their escaping injury.

The writer also knows of other buildings which have been wired with this wire ("Stannos," I think it is called), and which have required no attention since the wire was installed ten years ago.

J. K. G.

Hamilton.
February 27th, 1921.

The Rating of Motors.

Your report of Hartley *v.* Lancaster Corporation (February 18th, p. 200) is of great interest in view of the possibility of wider use of multi-part charges for electric supply.

In many cases it is convenient to base the fixed charge under such systems upon the reputed or marked horse-power or kilowatt capacity of the motors or apparatus installed, and although I have not heard of such a case before, there is always room for argument about this feature.

In introducing systems of this kind, it might be worth while for engineers to consider the advisability of inserting in the agreements a "capacity agreed clause," something like the "age agreed clause" which one finds in life insurance policies. This would mean that at the time of making the

arrangement the supplier and the consumer had agreed the capacity of the apparatus and the basis of the fixed charge, and then it would not be competent for any question to be raised upon it in the future.

British Electrical Development Association, Inc.,
J. W. Beauchamp,
London. *Director and Secretary.*
February 23rd, 1921.

The Cost of Wiring New Houses.

Having read with interest several accounts of the cost of wiring new houses and the erecting of mains to them, I thought the following statement of the cost of wiring and running mains to 22 new houses erected in this town might interest you.

The installation consisted of eight points per house, carried out in slip-joint conduit at the cost of 35s. per point, making a total of £308 for 22 houses.

The method of distribution to the houses was by overhead mains consisting of No. 4 gauge hard-drawn copper wire, the 2-wire system being used and the run of the wire 300 yards.

One chimney on each house was utilised for supporting the wires, the chimney being timbered with 3 in. by 3 in. oak clamped on the chimney by ⅝ in. bolts, and the wire supported by G.E.C. insulators; the cost of mains and the erecting of them was £60, making a total for the complete job of £368.

The above, I think you will agree, makes a cheap and efficient method of supplying houses erected on the outskirts of a town.

G. W. Leggett.

Stowmarket.

The Reduction in the Price of Lamps.

I read with interest Mr. C. Culmer Hodges' letter in last week's Electrical Review. I quite agree with him, and I also wrote demanding a rebate on February 1st, but have only just received the reply that "owing to the pressure of work, special claims must wait." Meantime I am compelled to sell and stand to pay out for the honour of selling their lamps. E.L.M.A. members' lamps are chronic enough without this additional agony. When lamps were raised some time ago I was "busy elsewhere," and did not reap any benefit from this rise in price as doubtless a good many other contractors, &c., did. The best way to bring the E.L.M.A. to their senses is to refuse to handle their members' lamps. Continental makers and other English makers will be glad to supply, and in these days of strikes I propose we strike against handling lamps of the E.L.M.A. Such combined action would have but one result. Finally, what are the E.C.A. doing in the matter?

Harold L. Smith.

London.
February 28th, 1921.

Induction-Generator Installations.

I have read with considerable interest the article in your issue of February 18th, on the electrification of Messrs. Rouse Bros.' woollen mill, as I have thought for some time that there is a wide field in which the induction generator can be used.

Could not an electrical transmission scheme on a big scale be worked up on the lines indicated in your article? that is, with induction generators, driven by water turbines, generating at a moderate voltage; the energy required near the power house being used at that voltage, and any surplus being fed at a high voltage with overhead cables into a general transmission system. The magnetising current for the generators would have, of course, to be supplied by synchronous generators, but the system seems to afford a means of utilising the water power of the United Kingdom without the disadvantages of schemes like the Severn barrage.

Waterfalls with a large head of water practically do not exist in this country, but there are, especially in the hilly districts in the north and west of England, as well as in Scotland, large numbers of streams which, though individually small, will give in the aggregate a large quantity of energy, provided that there is electrical apparatus available by which the energy can profitably be utilised in small quantities. In the induction-generator system, the alternators, water turbines, and switchgear are much simpler both in design and operation than the usual pattern, and this should considerably cheapen the capital cost per kW of output, and make it a commercial proposition for small powers.

Secondly, it can be commenced on a small scale, and the area and plant increased as time goes on, whereas, in the Severn and similar schemes, an enormous quantity of capital must be sunk to produce any result. It must be on a big scale or not at all.

The scheme outlined above is something like a banking system whereby the surplus credit is collected in small quantities from a large number of people until the total makes a huge sum, which can be used as desired. The analogy is still further useful as, in practice, a considerable amount of the credit is used at the place of origin, and the difference only is transmitted any distance.

It is obvious that any solution of our present difficulties can only come by mechanical means, that is, by the use of a method by which energy can be made available at a much less expenditure of labour and material than at present.

The Severn scheme offers at the best only a small decrease in the cost of energy, whereas to be of any avail we must have an improvement like the application of steam in the early part of the nineteenth century, which increased the result of labour many times over the manual methods that had previously been used.

C. E. A.

February 24th, 1921.

[In our issue of September 19th, 1919, we reproduced in abstract an article by Dr. C. P. Steinmetz which had appeared in the *General Electric Review*, in which this proposition was discussed. Dr. Steinmetz then said: "There are already a number of such hydro-electric induction-generator installations throughout the country (U.S.A.), some in successful operation for years, and the field thus opened up is very large, larger possibly than all the electrical development which has taken place hitherto; and one of the features of this development is that no new type of apparatus requires to be developed, but the standard induction motor can be used as an induction generator, and has been used successfully for years in some cases." The article in our issue of February 18th was inserted because it afforded a concrete instance of the successful application of this principle, to which, in common with our correspondent, we attach much importance. Not only small water powers, but also small waste-heat installations can be utilised in this way. The plant and its operation are, as he says, quite simple. The Thury system can be similarly applied, as proposed by Mr. S. E. Britton for the Chester scheme.—Eds. Elec. Rev.]

The "Hotpoint" Trade Mark.

With reference to the report in your issue of February 18th under the heading "Legal," we do not think this makes it clear that we were successful in our opposition to the application by the American Hotpoint Co. for the registration of their trade mark so far as our goods are concerned. The Court will allow the American Co. to use the word "Hotpoint" as a distinctive mark on their manufactures, *excluding irons for industrial, domestic, and laundry use, and soldering and branding irons*. These are the goods which we have manufactured for many years under the Eastman and Warne patent, and known as "Hotpoint Irons." We shall therefore continue to use the name which we have all along claimed as distinctive of our manufactures as above.

We may add that we think it is most unreasonable for a foreign company to make application for a registration which, if it had been granted, would have prevented our using the term under which thousands of our appliances have been manufactured for many years past; in fact, ever since the granting of the patent. The American Co. was ordered to pay the respondents' costs.

The Dowsing Radiant Heat Co., Ltd.,
H. J. Dowsing,
London. *Managing Director.*
February 22nd, 1921.

The Life of Metallic-filament Lamps.

Referring to the correspondence on the above subject, I should like to give a few more particulars as regards the behaviour of lamps under my supervision.

As the E.L.E. Co. remark, temperature plays an important part in the life of a lamp. I have noticed this, as in certain departments in this factory the temperature is considerably higher than that of the surrounding air. The gasfilled lamps, in this instance, are not enclosed in fittings of any sort. Even the shade has been removed, to give them as much ventilation as possible. Yet their life is somewhat less than that of lamps burning in atmospheric temperature. I presume this is unavoidable under the existing conditions.

Several of the fittings I have seen for enclosing half-watt lamps have inadequate ventilation, to my mind.

Like "Maintenance," I also had to employ lamps of a higher voltage than the supply voltage. This prolongs the life to a certain extent, but one cannot introduce such a system for the vacuum lamp, as it causes such a decrease in the candle power.

I have inquired about the present quality of lamps, and am told by the travellers that it is owing partly to the poor tungsten wire obtainable.

Occasionally I have had lamps (not frequently, I am glad to say) which burst immediately the current was switched on. On examination, some of these exhibit signs of being short-circuited at the inner leads where the connections for the filament leave the glass. I have always been under the impression that all lamps are tested before leaving the works. If this is the case, how can one account for such defects (vacuum type only)?

This is, I hold, rather dangerous, as one is frequently compelled to insert lamps into live holders, and at such close quarters the eyes are liable to receive a share of the glass splinters.

A section of the works in question has two factors militat-

ing against lamps, viz., heat and vibration. But apart from this, there is usually a fierce static discharge. As the lamps have to be very close to the structure, would this in any way affect their life? Personally, I cannot find a reason, but should any readers have any ideas to put forward, I should be pleased to hear them.

J. W. H.

February 18th, 1921.

"A Regular Reader."—Your letter is interesting, but we cannot publish it unless we have your name and address, not for publication.—Eds. Elec. Rev.

LEGAL.

Phœnix Dynamo Manufacturing Co., Ltd., *v.* Mountain.

In the King's Bench Division on February 23rd, Mr. Justice Rowlatt, sitting as Commercial Judge, heard an action brought by the Phœnix Dynamo Manufacturing Co., Ltd., of Thornbury Works, Bradford, against Mr. H. S. Mountain, a Lloyd's underwriter, to recover a loss under a policy of insurance on a flying boat. The policy was dated October, 1918, and was between plaintiffs and defendant with other persons, and plaintiffs asked that defendant should contribute his share of the loss which subsequently took place.

Mr. Wright, K.C., in the course of his opening for the plaintiffs, said the policy was one covering all risks, except war risk, during construction, assembling, packing for transit, and transit of every kind to any naval air station in England and until the boat was taken over by the Government. Each boat cost about £10,000. Up to the armistice 100 of these boats were ordered from the plaintiffs, but after all 21 were cancelled. The boat which was the subject of the present action had been examined on behalf of the Air Ministry at Bradford and was then dismantled and placed on a trolley and drawn by road to Calshot Air Station on October 29th, 1919. When near its destination the locomotive drawing the trolley swung round and the hull of the boat caught in some trees and was very badly damaged, so much so that the Air Ministry would not accept delivery. The plaintiffs then had to replace it at a cost of £1,979, and they now asked that defendant should pay his share of the loss.

Defendant denied liability, and pleaded that the policy only covered flying boats after construction, assemblage, and packing for transit. Further, the defendant said the hull was not a flying boat, and was not packed for transit. He also argued that plaintiffs' interest ceased in the matter after the boat was handed over to the Government, and that the hull had not been so damaged as to necessitate replacement.

His Lordship, after having heard the evidence and arguments of counsel, held that the accident came within the risk undertaken by the policy of insurance, and therefore entered judgment for the plaintiffs with costs, for an amount to be agreed upon between the parties.

Quain *v.* Spink.

At Lambeth County Court, on Friday last, John Robert Quain, electrical engineer and inventor, of 17, Victoria Street, Westminster, brought an action against Joseph Ronald Spink, electrical works manager, of Effra Road, Brixton, claiming £20 money paid to defendant for manufacturing and dispatching to Canada two electric heating geysers. Defendant entered a counter-claim for £15, being balance due for wages, when he left plaintiff's employment in May, 1918, £35 arrears of salary being due, and in an affidavit he held that the £20 now claimed was paid him on account of the arrears of salary, leaving £15 still owing. Without calling on defendant, his Honour gave judgment for defendant on the claim and counter-claim, with costs.

North Metropolitan Electric Supply Co., Ltd., *v.* Mayor, &c., of Stoke Newington.

The summons in this case, in which a considered judgment was reported in our issue of December 24th, was mentioned to Mr. Justice P. O. Lawrence in the Chancery Division on Friday last.

Mr. C. E. E. Jenkins, K.C., for the defendants, said the order was not to operate pending notice of appeal if it was given by January 31st, and in any case its operation should be stayed over the first day of the Easter Sittings. The order also stated that the plaintiffs were to supply the defendants with power on the footing of the agreement modified by the coal clause.

Mr. Tyldesley Jones, K.C., for the plaintiffs, submitted that the defendants had lost their right of appeal because they had not given notice before January 31st. The arrangement was that the plaintiffs were to go on supplying the defendants with power if notice was given by that date, and it was vital to the plaintiffs to know whether the agreement was going to stand or not. They had proceeded on the basis that the agreement was dead, but that the temporary stay was in operation.

His Lordship: What do you want me to do—to preclude the defendants from appealing?

Mr. Jones: Yes.

His Lordship: I cannot do that, although I think you are entitled to every indulgence.

Mr. Jenkins, replying to a question whether the defendants could definitely say whether they were going to appeal, said that at present they could not because that depended rather upon certain negotiations now in process.

His Lordship said he could do nothing to prevent the defendants taking advantage of the stay over the Easter Sittings. The order would be drawn up and everything cut out except the stay.

Oldham, Ashton & Hyde Electric Tramway, Ltd., *v.* Corporation of Ashton-under-Lyne and Others.—Arbitration Appeal.

The Court of Appeal, consisting of Lords Justices Bankes, Scrutton, and Atkin, on Friday, reserved judgment in this case upon the appeal of the Tramway Co. from the decision of Mr. Justice Rowlatt upon the items in the arbitration between the parties as to the purchase price to be paid to the Tramway Co. by the Ashton Corporation, the Hyde Corporation, and the Audenshaw and Denton Urban District Councils. The arbitrator awarded the company £142,000. The purchasing authorities said he ought not to have allowed certain items in his valuation, and that other items ought to be depreciated. They appealed to Mr. Justice Rowlatt, and he came to a conclusion favourable to the Tramway Co. on certain items; but on the four items in question, he decided against the company. These items were as follows: The engineering fees, cost of raising capital, interest on capital during construction, and the expenses incurred by the company in respect of alterations to the Guide Bridge.

A Non-union Installation at Pretoria.

In the Supreme Court in Pretoria, a case was heard in which the Transvaal Property & Investment Co., Ltd., asked for an order calling on the Municipality of Pretoria to connect an electric light installation in a certain building. It appeared that non-union labour had been employed on the installation and the premises were black-listed. The Municipality said that it was unable at present to concede the demand for a connection, and that if the result of supplying electricity were to jeopardise the interests of the ratepayers the Municipality was justified in refusing the supply. Judgment was reserved.

Informing the Uninitiated.—Critics of the Hackney electricity undertaking have pointed out with great indignation that, although the average cost per unit generated is 1·78d., the Council has been selling electricity in bulk to other authorities at the ridiculously low price of ·6d. per unit. It has been necessary, therefore for the borough electrical engineer, Mr. L. L. Robinson, to explain how this can be done without incurring an apparent loss of 1·18d. per unit. He points out that the bulk supply unit and the average unit sold are not identical in character. The e.h.p. bulk supply unit is delivered straight from the station bus-bars; it improves the load factor; it is often an additional load involving no extra overhead charges; and continuity of supply is not compulsory. On the other hand the average unit sold commences as an e.h.p. unit but is not finished with at this stage. It is first transmitted to a sub-station, then transformed to a lower pressure and converted to d.c. It is then transmitted through l.p. feeders and distributed by distributors and services. Then rolling, metering, and administrative charges are incurred, while it is necessary to ensure continuity by maintaining reserve plant, &c. In addition to this, it is to be remembered that the losses between the power station and the ordinary consumer's premises amount to about 20 per cent. The engineer also points out the benefits derived from a linking-up scheme, and, to force his point home, adopts a very homely simile relating to the cooking of a pie by a certain Mrs. Jones, and showing how the average cost per pie falls when Mrs. Jones cooks her neighbour's pie at the same time. The initiated will fail to see the use of these comparisons, but we consider them quite valuable in bringing home to the non-technical some points of great importance, and they might prove of some advantage to many of our readers who find it difficult to explain these things to their customers in other than technical terms.

Electrical Trades Benevolent Institution.—The Local Advisory Committee of Newcastle and District organised a dance in aid of the funds of the Institution, which was held at the Grand Assembly Rooms, Newcastle-on-Tyne, on Friday last. The Committee, owing chiefly to the energy of Mr. T. W. Anns, secretary of the Local Committee, Mr. Robson, Mr. Fletcher, and Mr. Spence, attained a most successful result, more than 350 tickets having been sold, and about 270 guests being present at the ball. It is hoped that, as a result, about £100 will be added to the funds of the Institution. The guests were received by Mr. W. C. Mountain, chairman of the Local Committee and Mrs. Mountain. Among those present were the Lord Mayor and Lady Mayoress of Newcastle, Mr. and Mrs. Stephen Holmes, Mr. H. W. Clothier, Mr. and Mrs. Pragnell, Major Steele, and Mr. F. R. O. Hawes, secretary of the Institution. The electric lighting had been specially arranged by the General Electric Co., Messrs. Fletcher Bros., and Messrs. Robson & Coleman, and in the course of the evening various effects, probably novel in a ballroom, were produced by means of searchlights, one of the best of these being that of falling snow.

BUSINESS NOTES.

Bankruptcy Proceedings.—J. Jones and J. R. Jones (J. Jones & Son), electrical engineers, of Chapel Street, Penzance.—First meeting, March 4th; public examination, March 15th; both at Truro.

Mr. T. B. Gordon, electrician and general merchant, 20, Western Broadway, King Street, Hammersmith, W.—Receiving order made February 22nd, on debtor's own petition. First meeting, March 7th; public examination, April 22nd; both at Carey Street, W.C.

Company Liquidations.—Bat Motor Manufacturing Co., Ltd.—A petition for the winding up has been presented to the Croydon County Court by Fellows Magneto Co., Ltd., and will be heard at Croydon on March 17th.

Bat Meter Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. E. Denney, 123-4, Finsbury Pavement House, E.C. 2. Meeting of creditors to-day at 3, Eden Street, Hampstead, N.W.

British Electro Chemists.—Winding up voluntarily; Mr. H. J. Gully, 1, Broad Street Place, E.C., liquidator. Meeting of creditors, March 9th, at Broad Street Place.

Mutual Electric Trust, Ltd.—Particulars of claims must be sent to the liquidator, Mr. A. E. Wake, Norfolk House, Laurence Pountney Hill, E.C., by March 31st.

Electrical Power Storage Co., Ltd.—Meeting of members is called for March 31st at 3, Fenchurch Street, E.C., to hear an account of the winding up from the liquidators, Mr. J. Gray and Mr. W. A. Reed.

Metric Engines, Ltd.—Winding up voluntarily. Liquidator, Mr. T. D. Cooke, 44, Gresham Street, E.C. Meeting of creditors, March 10th, at the Institute of Chartered Accountants, Moorgate Place, E.C.

Grimsby Electric Welding Co., Ltd.—Meeting of creditors, at the offices of the company, Fish Docks, Grimsby.

E.I.C. Magnetos, Ltd.—A meeting of members is called for April 4th, at 12, Cherry Street, Birmingham, to hear an account of the winding-up from the liquidator, Mr. E. H. Sherrey.

Electrical Industries, Ltd.—First meeting of creditors and contributories, March 9th, at Carey Street, W.C.

F. Hudson & Co., Ltd., 88-90, Chancery Lane, London, W.C. 2.—Mr. W. E. Harris has been appointed receiver and manager for the debenture-holders.

Dissolution of Partnership.—H. Nuttall & Co., electrical engineers, 28A, Bury Old Road, Crumpsall, Manchester.—Mr. H. Nuttall and Mr. D. E. Whittaker have dissolved partnership. Mr. D. E. Whittaker will attend to debts.

Trade Announcements.—Messrs. J. G. Ellis & Co., Western Mail Chambers, Cardiff (Telephone, Cardiff 2892), will act as agents for the whole of South Wales for Messrs. A. Verey & Co., Ltd, for the supply of wiring accessories generally.

Messrs. J. E. Lester & Folwell, Ltd., have removed into their new premises at 60, London Road, Leicester. Telephone number, 3698.

Messrs. Albert Lee & Co., Ltd., have opened new showrooms at 8 & 9, New Zealand Avenue, E.C. 1. for the display of glassware for electric lighting and other purposes.

Messrs. Brown, Boveri & Co., Ltd., and their associated companies, are to-day removing to Trafalgar House, Waterloo Place, London, S.W. 1.

Catalogues and Lists.—The Elco Manufacturing Co., Colston Street, Bristol.—An illustrated pamphlet, giving particulars of switchboards for private electrical installations.

Messrs. Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C. 2.—Pamphlets L. 164 describing a 1½-kW quenched-spark transmitter for ship installations; L. 166, marine pattern wireless direction finder (Type 11A); L. 168, 3-kW continuous-wave transmitter for telegraphy and telephony; and L. 169, portable wireless telephone-telegraph set. All of these are fully detailed and illustrated by photographs and diagrams.

Messrs. Isaacson & Brown, Ltd., 39, Furnival Street, Holborn, E.C. 4.—A priced and illustrated leaflet of "Bettalite" bowl fittings of various types.

Metropolitan-Vickers Electrical Co., Ltd., 20, Brazennose Street, Manchester.—Special Publication No. 7,855/1B. An illustrated booklet showing installations of Metropolitan-Vickers buffing motors. Also Special Publication No. 7,974/2A, dealing with the electrical equipment of the modern kinematograph theatre with a copy of the rules and orders relating thereto.

Messrs. Tredegars, Ltd., 7, Brook Street, W. 1.—A set of about 30 photographic reproductions of carved wood fittings for electric lighting. These, which include pendant fittings, lamp standards and brackets, are very beautifully executed. Also a small brochure illustrated in black and white and colour, dealing with flower bowls of clear glass, onyx alabaster, &c.

The Edison Swan Electric Co., Ltd., Ponders End, Middlesex.—Leaflet No. A.A. 214 dealing with "Ediswan" circuit breakers.

Messrs. Dexter Bros., Bassishaw House, Basinghall Street, E.C. 2.—A description and price-list of rubber-tanned leather for belting and other purposes.

The Screwless Grip Fitting Co., 4, Lower George Yard, Halifax.—A small illustrated pamphlet dealing with conduit fittings, and an anti-vibration fitting for electric lamps.

Messrs. Wright & Son, Edgware, Middlesex.—An illustrated and priced leaflet dealing with polished aluminium holders for the new motor-car and cycle licences. Also a folder illustrating embossed aluminium number plates for cars and cycles.

X-Rays, Ltd., 11, Torrington Place, Gower Street, W.C. 1.—Sectional catalogue No. 6 (44 pp.), giving illustrations and full details of all kinds of X-ray apparatus; fully priced. Also two price lists of X-ray photographic plates.

Messrs. Johann Wolff & Co., Gouda, Holland.—A list illustrated in black and white and colour giving descriptions in English, French and German of majolica wall and ceiling lighting fittings. Priced in Dutch florins.

Messrs. Henry Ford & Son, Ltd., Cork, Ireland.—"Fordson Worker," Vol. I, No. 4. This is a news-sheet dealing with events at the firm's factory, and includes a number of humorous and other items.

Messrs. Spauldings, Ltd., 40, Gloucester Street, Clerkenwell, E.C. 1.—A well-illustrated leaflet showing a number of forms of vulcanised fibre, including bushes, washers, switch-handles, armature parts, &c.

The British Thomson-Houston Co., Ltd., Rugby.—Descriptive list No. 5,600 (52 pp.). An illustrated and detailed description of automatic contactor gear for a.c. and d.c. circuits.

Superlamp, Ltd., 11, Great Eastern Street, E.C. 2.—A price list of vacuum and "half-watt pattern" lamps.

Messrs. Alfred Herbert, Ltd., Coventry.—Catalogue sheets (illustrated) Nos. FST 49. "Prestwich" fluid gauges; 182, "Leonard" plug and ring gauges; 189, Wickman patent adjustable thread snap gauge, and 190, hardened plug and ring screw gauges.

Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C. 4.—Pamphlet No. 6,017/460, illustrating and describing the "Igranic" patent distant stop push-button system of controlling electrical machinery. Priced. Also an application post-card for a sample of the device.

Messrs. Higgs Bros., Sand Pits, Birmingham.—Monthly Magazine for March. Price lists of motors and dynamos appear as usual, as well as notes on the choice of electricity supply, and humorous items.

Messrs. H. W. Smith & Co. (1920), Ltd., Central House, Kingsway, W.C. 2.—A four-page price list of single V.I.R. cables, cotton-covered wires, &c.

Book Notices.—"The Magnet Magazine." Vol. VI. No. 23. January, 1921 (124 pp.). Price 6d. General Electric Co., Ltd.—This number of the magazine is excellently produced, and contains numerous notes and articles of great interest. The Witton Works extensions are fully described and illustrated, and "Thermionic Valves," "Fractional h.p. Motors," "The Electrification of a North Country Colliery," are some of the subjects dealt with.

"A Practical Guide for the Water Supply of Towns, Estates, Villages, Houses, &c." (120 pp.). London: Hayward, Tyler & Co., Ltd., 99, Queen Victoria Street, E.C. 4. Price 3s. 6d.—This volume has been designed for the use of architects, estate agents, district surveyors, and others interested in water supply. It illustrates the firm's manufactures, and gives hints on the best type of plant to be adopted in particular circumstances.

"Touring by Motor Coach"—Season 1921 (pp. 79). Atherton: The Lancashire United Tramways, Ltd. Price 1s. 6d. This is a beautifully-illustrated guide-book describing the places and scenery which lie within range of the company's motor-coach services. The booklet includes a number of appreciations from last year's clients, conditions of hiring, &c.

"The Queen's Engineering Works Magazine." No. 18. January, 1921 (pp. 106). Bedford: W. H. Allen, Sons & Co., Ltd.—Among a number of interesting notes and articles appearing in this issue are a description of H.R.H. the Duke of York's visit to the works (with a portrait), "The Development of the Steam Turbine," "Salvage," "A Modern Fighting Aeroplane," and "The Telemotor System of Steering-Gear Control."

"Central Electric Stations in Canada" (Census of Industry, 1918). Pp. xxiii + 29 + xxi. Ottawa: Dominion Bureau of Statistics. Price 10 cents.—This volume consists of a summary and introduction in English and French, and exhaustive details in both languages of all undertakings, both generating and distributing, in the Dominion.

"Welfare Work." Vol. II, No. 14. February, 1921. London: Welfare Workers' Institute. 5s. per annum.—Includes articles on "Welfare Work from the Employers' Point of View: Does the Need for it Exist To-day?" and "Factory Welfare Work: Its Principles and Possibilities."

"*Journal* of the Institution of Electrical Engineers," Vol. LIX, No. 296. December, 1920. London: E. & F. N. Spon, Ltd. Price 10s. 6d.—This issue contains the following:—Inaugural address by the President (Mr. Ll. B. Atkinson), and the chairmen's addresses to the South Midland, Western, North-Eastern, North-Western, Scottish, North Midland Centres, and the Liverpool and East Midland Sub-Centres; also the inaugural address to the Wireless Section by the chairman, Prof. W. H. Eccles.

"*Journal* of the American Institute of Electrical Engineers." Vol. XL, No. 2. February, 1921. New York: The Institute. Price $1.

"Domestic Fuel Consumption." By A. H. Barker. Pp. x + 160; 11 figs. London: Constable & Co, Ltd. Price 14s.

"Engineering as a Career." By P. & A. W. Marshall. Pp. 56. London; Percival Marshall & Co. Price 9d.

"Quin's Metal Handbook and Statistics, 1921." Compiled by L. H. Quin. London: The Metal Information Bureau, Ltd. 5s. net, post free.—This is the eighth year of publication of a book which contains particulars of world outputs, prices, and imports and exports, and other statistics of all metals, such as readers of our pages are frequently requiring.

"The Mining Electrical Engineer." Vol. I, No. 5. February, 1921. Manchester: Association of Mining Electrical Engineers. Price 1s. net.—This number contains a copy of a Government Order approving certain types of miners' lamps, giving diagrammatic illustrations and detailed descriptions. The papers include "Telephones for Use in Noisy Places, and for Rescue Work in Mines" (illustrated), and "The Choice of a Small Electric Winder" (illustrated).

Sir Isaac Pitman & Sons, Ltd., have now commenced issuing their new Technical Primer Series, which promises to be a very large one. The first eight volumes are now ready, and several others will be published during this month. These little books are in foolscap 8vo, contain about 120 pages, with an attractive cover design, are printed on good paper, and well illustrated. The price is 2s. 6d. net each volume. The series will eventually contain volumes on every phase and branch of technology.

"Standard Measurements Adopted by the Incorporated Association of Kinematograph Manufacturers, Ltd." (Pp. 21.) London: The Association. Price 6d.—This volume deals with the standardisation of films, masks, projector spools and re-winding spindles, focusing jackets, optical attachments, &c.

Publication of the Massachusetts Institute of Technology, No. 24, "The Transient Process of Establishing a Steadily Alternating Current on a Long Line, from Laboratory Measurements on an Artificial Line," by A. E. Kennelly and U. Nabeshima (pp. 46). Boston: The Institute.

"Elementary Telegraphy." By H. W. Pendry. Pp. x + 238; 181 figs. London: Sir I. Pitman & Sons, Ltd. Price 7s. 6d. net.

Copper and Lead Prices.—Messrs. F. Smith & Co. report March 1st:—Copper (electrolytic) bars, £75, £4 decrease; ditto sheets, no change; ditto wire rods, £91, £4 decrease; ditto h.c. wire, 1s. ½d., ½d. decrease; silicium bronze wire, no change.

Messrs. James & Shakespeare report, March 1st:—Copper bars (best selected), sheet and rod, £118, £2 decrease; English pig lead, £19 10s., 2½s. decrease on last week's price.

New Italian Companies.—Among the new companies recently formed in connection with the electrical industry in Italy are the Società Osram, Milan, with a capital of 1,000,000 lire; the Società Fabbrica d'Accumulatore Hemsemberger, Tentori, Ing. Cigolotti, Blanc e Cia., Monza, capital 1,000,000 lire; and La Società Elettrometallurgica Sarde, Milan, capital 1,000,000 lire.

A Women's Exhibition.—The Director and Secretary of the Electrical Development Association informs us that an "Indoors and Out" Exhibition is being organised by "The Women's Leader" and "The Women's Institutes" at the Central Hall, Westminster, from May 23rd to 28th this year. One of the sections deals with the heating and lighting of the home, and another with labour-saving devices.

Forthcoming Exhibitions.—The following exhibitions are being organised:—

London.—March and October, Society of Motor Manufacturers and Traders; April 1st to 30th, Building Trades' Exhibition; April 30th to May 14th, Stationers' and Allied Trades' Exhibition; June 3rd to 17th, Rubber Trades' Exhibition; July 4th to 15th, London Fair and Market; September 7th to 28th, Shipping, Engineering, and Machinery Exhibition; November 17th to 25th, Public Works, Roads, and Transport Exhibition. 1923.—British Empire Exhibition.

British Dominions.—June, 1921, Dominions Touring Exhibition (*South Africa, Canada, Australia, and New Zealand*).

France.—(*Lyons*) March 1st to 15th, Metallurgy, Engineering, Building, &c., Fair. (*Bordeaux*) June 15th to 30th, International Samples Exhibition.

Belgium.—(*Brussels*) April 4th to 20th, International Commercial Fair. (*Ghent*) April 16th to June 14th, International Exhibition of Architecture, Building, and Kindred Industries.

Switzerland.—(*Basle*) May 28th to June 8th, International Automobile Exhibition.

Holland.—(*Utrecht*) September 6th to 16th, International Fair.

Italy.—(*Milan*) April 12th to 27th, International General Manufacturers' Fair.

Spain.—(*Barcelona*) April 1st to 10th, International Samples Fair.

Iceland.—(*Reykjavik*) June, World's Fair.

Peru.—(*Lima*) June 1st to October 31st, International Industrial Exhibition.

Argentina.—(*Buenos Aires*) 1922, International Exhibition.

Brazil.—(*Rio de Janeiro*) 1922, International Centenary Exhibition.

Mexico.—September, Commercial and Industrial Fair.

Java.—(*Bandoeng*) September 19th to October 9th, Netherlands East Indies Fair.

An Electrical Exhibition.—An electrical exhibition promoted by the Electrical Contracting and Motor Co., Pontefract Road, Castleford, under the management of Mr. E. Mercer, A.M.I.E.E., was opened last week by Mr. W. B. Woodhouse, engineer and manager of the Yorkshire Electric Power Co., Ltd. The display consists of all kinds of electrical and labour-saving devices. The exhibition was so successful that it was decided to continue it for another week.

Wages Reduction Strike.—A reduction in the wages of cable splicers from $8 to $7 per day, of linesmen from $7 to $6 per day, and of operators from $200 to $175 per month by the Great Western Power Co. of California has been followed by a strike. The company says that less than half of its men have left, that its service has not been impaired, and that new men are rapidly filling the places vacated. The company claims that the increase of $1 per day granted last year was to compensate for increased living costs, which have now materially decreased. The company further states that the last increase put its wage rate above those generally in effect on neighbouring systems. The strikers assert that last year the company received an increase in rates to compensate for the increase in wages, but that with this decrease in wages there has been no corresponding decrease in rates.—*Electrical World.*

Socials.—On February 19th, the directors and combined staff of Messrs. Wood & Cairns, Ltd., Edinburgh, Glasgow, and Dundee, held a successful gathering in the Windsor Rooms, Edinburgh. The company numbered 64, and the proceedings opened with a whist drive. Dinner and dancing followed. At the dinner the chairman (Mr. R. K. Hill) introduced to the staff, Mr. H. Mason, who had joined the directorate.

At the annual dinner of the staff of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board, last week, Alderman Sykes remarked on the fact that for over a dozen years the Board had held the record for the lowest working costs in the United Kingdom. After the dinner a presentation was made to Mr. H. Cattle, who has taken up a position at Ashton-under-Lyne Electricity Works.

Dinner-time concerts are given every Tuesday at the works of Messrs. Ferguson & Pailin, Openshaw, Manchester, and according to one of the officials, the best results from the employés come on Tuesday afternoons. The firm bears all expenses.

At the ninth annual social of the Blackpool Electricity and Tramways Employés' Institute, last week, there was a record attendance. Over 1,500 people played whist in the lower ballroom, and well over 2,000 participated in the dancing.

Scottish Electricians' Wages.—A serious crisis has arisen in the Scottish electrical trades on the question of wages, and a stoppage is now feared. The Scottish Contractors' Association has intimated to the Electrical Trades Union that on and after March 1st wages will be reduced 3d. an hour. The present minimum is 2s. 3d. About 3,000 men are involved. The Union counter-claimed for a rise of 6d. an hour, which has been refused. It is stated by the Union officials that the employers' decision has come as a surprise, as there was a mutual understanding that a further conference would be arranged before any change was made. The matter has been referred to the National Executive.

Telephone Manufacture in Australia.—A Press report published in Sydney toward the end of December states that an early addition to the numerous new Australian industries then being projected was that of the manufacture of automatic telephones. Mr. R. Mordin, engineer, representing the Relay Automatic Telephone Co., London, was a recent arrival from England in this connection.

French Aluminium Prices.—It is stated that a new reduction in prices has been made by the French producers of aluminium. Ingots are now at 9·36 fr. per kilo for an order for 1,000 kilos, with a rebate of 4½ per cent. to 8·93 per kilo for 10,000 kilos; and sheets are at 12 fr. per kilo, as compared with 14 fr. previously.

Lead.—Messrs. James Forster & Co. reporting under date February 26th, stated:—"Closing prices yesterday were £16 10s. for February, and £17 10s. for June, against £20 and £20 15s. respectively at the end of last week—a fall of £3 10s. per ton. Yesterday's fall on the day was no less than 30s. to 35s. per ton. . . . Imports have been heavy this week, and have come both from Germany and Belgium but in spite of this, at the end there are actually borrowers of February lead who could not get accommodation—a singular commentary on the week's selling, and certainly an indication that all the lead coming in is finding a billet. In such conditions it is quite impossible to say when the turn will come, but such figures as are now current should be tempting to any consumer."

Norway.—The Government, on February 23rd, concluded with the Bergens Privatbank, acting on behalf of a consortium consisting of that bank, the Centralbank, and Den Norske Handelsbank, a contract for a loan of 50,000,000 kr., from which advances will be made to municipalities for the completion of electrical works. The loan, which will be offered for public subscription, will bear interest at the nominal rate of 6½ per cent. For the first five years there will be no redemption, but after that period the loan will be redeemable in 25 years.—*Reuter* (Christiania).

The Japanese Import Duty on Zinc.—It is stated that the Government has practically decided to raise the import duty on zinc from the present rate of 5 per cent. to 15 or 20 per cent. A rebate will be paid to the paint, toilet goods, rubber and electrical goods manufacturers, who are opposed to the increase. The proposal will be submitted to the present session of the Imperial Diet. *Reuter's Trade Service* (Tokio).

For Sale.—Messrs. Davis & Moon will sell by auction, on March 10th, at 13, High Holborn, W.C., an electrical engineer's and contractor's stock-in-trade. For particulars see our advertisement pages to-day.

New French Companies.—There has been formed at Lyons (12, Rue Grôlee) the Energie Electrique du Massif-central, for the utilisation of waterfalls and the erection of hydraulic and hydro-electric installations. The company's capital is 1,800,000 fr.

With the title of Société Grenobloise d'Applications Electriques et Mécaniques, has been formed at Grenoble (13, Rue de Strasbourg), a company, for the study, construction and sale of electrical and mechanical material and the institution and working of all kinds of electrical and mechanical processes. The capital is 1,000,000 fr. in 500 fr. shares, of which 284 are allotted to the Société A. Rivoire et Cie. as consideration for its assets.

The Etablissements Hediger is the style of a company embodied at Paris (47, Rue de Paradis), for acquiring a goodwill and business in electric lighting and heating apparatus. The capital is 250,000 fr. in 1,000 fr. shares, of which 175 are allotted to M. Hediger for his assets.

Under the style of G. Crampon et G. Lafont, a company has been constituted at Paris (8, Rue de la Pompe), for the carrying out of electric installations. The capital is 300,000 fr.

Under the designation of Société Française pour l'Exploitation des Brevets Bates, has been formed at Paris (25, Rue de Clichy), a company for the manufacture of cable and conductor standards, and accessory electrical appliances, and also to work in France the patents of the Bates Expanded Steel Trust Co., of Chicago. The capital is 2,500,000 fr., with power of increase to 3,500,000 fr.

Workmen's Compensation Act.—At the meeting of the Institute of Cost and Works Accountants, on Wednesday, March 16th, a lecture is to be delivered by Mr. H. G. Simmons on "Some Observations on the Proposed Amendments of the Workmen's Compensation Act, 1906."

An E.D.A. Pamphlet.—The director and secretary of the Electrical Development Association, Hampden House, 84, Kingsway, W.C. 2, has sent us a copy of a recently-issued pamphlet (E.D.A. 130) giving photographs and a description of a housing colony erected by Messrs. Philips Glow Lamps Works, Ltd., for their employés at Eindhoven, Holland. In every house electricity is used for lighting, heating, and ironing. The wiring is run in a tubing system. From nine to eleven lighting points have been installed in each house, at an average cost of 28s. 4d. per point; electricity is supplied by the municipality at 7½d. per unit by prepayment meter.

Engineering Wages.—Conferences have been taking place in Birmingham between the employers and the Unions regarding proposed reduced wages for boys and youths under the age of 21 years in the engineering and allied trades. So far, agreement has not been reached.

Key Industries.—The Premier, replying to a question by Mr. G. Terrell, M.P., has expressed the hope that the Bill to safeguard key industries and to regulate imports may be introduced before Easter, so that it may be proceeded with immediately thereafter.

Wages Reduction in Sweden.—The staff of Allmänna Svenska Elektriska Aktiebolaget, at Vaesteraas, were recently informed that their wages would be reduced by 20 per cent. as from February 28th.—*Reuter's Trade Service* (Stockholm).

Liquid Fuels Research.—The British Research Association for Liquid Fuels for the Oil Engine Industry has been approved by the Department of Scientific and Industrial Research. The secretary of the Committee engaged in the establishment of this association is Mr. Percy Still, M.I.E.E., M.I.P.T., 19, Cadogan Gardens, S.W. 1.

Charging for a Switch.—Before the City of Westminster Profiteering Committee, on Wednesday, a complaint was heard against the Edison Swan Electric Co., Ltd., Ponders End, Middlesex, for charging, at its Victoria Street shop, the sum of 4s. 6d. for an electric light switch known as the "Better One," which, it was alleged, could be obtained for 3s. 3d. elsewhere. Mr. Morris, barrister (instructed by Messrs. Nicholson & Graham, solicitors), represented the respondent company. Complainant was Mr. A. Kernan, of the Marine Department of the Board of Trade, and he stated that the purchase was made on November 27th of last year. Subsequent to the purchase he made inquiries at another shop, and found that he could purchase a similar article of apparently better quality at 3s. 3d. In answer to the chairman, complainant said he did not purchase a further switch at the other shop he called at, but was shown one, which was said to be 3s. 3d. Mr. Morris, on behalf of the company, explained that a genuine error had been made in that case, and they admitted an overcharge of 6d. to the purchaser. The Committee accepted respondent firm's explanation that a genuine error had been made, and ordered a refund of 6d., the admitted overcharge.

Electrical Trade Situation at Singapore.—It is anticipated that there will be a great opening for electrical goods in a short time, as the use of electric lighting is still in its infancy here. There is a town supply, but it is limited, and most houses generate their own electricity. A large sale is reported of American self-contained motors and generators suitable for houses and estates.—*Reuter's Trade Service* (Singapore).

Indian Engineering states that the Netherlands Gutta-Percha Co. of Singapore intends opening a branch in Sourabaya (Java), and will manufacture there all sorts of cables and insulated wires. The new factory will be called the "First Neth. Ind. Cable Works," and will have also a wire-drawing installation. It will be the first of its kind in the Archipelago.

Representation in the Argentine Republic.—H.M. Acting Consul General at Buenos Aires emphasises the importance of actual representation by agents on the spot for United Kingdom firms wishing to enter or maintain their position in this market. In commenting on the many admirably produced British directories which have been issued since the war, and which furnish excellent facilities for advertising in South America, he points out that such advertising can only be regarded as supplementary to the work of a competent agent.—*Board of Trade Journal.*

Catalogues Wanted at Amsterdam. — H.M. Consul-General at Amsterdam invites British firms to send copies of their catalogues for filing and use at a Catalogue Reference Library that is being formed at the Consulate. These should be addressed direct to His Britannic Majesty's Consul-General, British Consulate, Amsterdam.

Electrical Demand in the Dutch East Indies.—There is a steady demand for electric-lighting installations up to 40 kW for estates, sugar factories, machine shops, and other industries in the Netherlands East Indies. Small lighting sets of 50 and 100-lamp capacity are also added as rapidly as they can be imported for houses and the smaller plantations. Larger electrical engineering projects are also maturing in this part of the world, and it is believed that a more substantial share of their trade might easily be diverted into British channels. This is particularly the case with regard to electric cables. In 1917, 93 per cent. of the electric cable imports came from the United States, 4 per cent. from the Netherlands, and 2½ per cent. from Great Britain; and in 1918, 45 per cent. from the United States, 53 per cent. from Japan, and one-half of 1 per cent. from the Netherlands. Before the war, electric cable, as well as most other electrical equipment for this colony, came from Germany.—*Indian Engineering.*

LIGHTING AND POWER NOTES.

Amesbury (Wilts).—Proposed Military Supply.—The Parish Council having proposed to have the parish illuminated by electricity supplied from the military station, has asked the Rural District Council to support an order to enable the Council to supply electricity to private consumers. The Rural District Council has referred the matter to a Committee.

Aughton.—Time Extension for Company.—A deputation from the Ormskirk Gas and Electricity Co. has waited on the West Lancashire Rural District Council, with a view to securing its consent to an extension of the company's powers in connection with the supply of electricity to the township of Aughton. The company's agreement, granted under the Act of 1915, expires in June next, and it was the intention, it was explained, to suspend the erection of a plant in Ormskirk pending the result of the inquiry into the Mersey and West Lancashire Electricity Scheme, from which the company hoped to obtain a supply in bulk. It was decided to grant the company an extension of four years to use its best endeavours to obtain a supply of electricity for Aughton as soon as possible, any costs in connection with the agreement being borne by the company.

Bury.—Electricity for Houses.—The Electricity Committee has instructed the electrical engineer to lay a cable to the site of the Walmersley housing scheme.

Continental. — France. — An official decree has authorised the Société des Forces Motrices du Vercors to develop the Falls of Pizançon on the River Isère, and erect a hydroelectric station of a capacity of 25,000 kW, to augment the power supply of that company's network.

The Société Electrique de la Sidérurgie Lorraine has in hand the preparation of plans for a power transmission network which will link up the various central stations of the ironworks of the East (Longwy, Micheville, Homécourt, Pont-à-Mousson, &c.). Several 65,000 and 30,000-volt lines are contemplated to feed this important network, apart from the 120,000-volt line projected by the State which will run from Vincey (Vosges), and end at Hirson (Aisne), which will supply power to the eastern ironwork industries in the districts which it traverses.

The Chemins de Fer du Midi is contemplating setting up three hydroelectric stations for the utilisation of the water power of the Vallée d'Ossau, and the Lac d'Arouste at Laruns. The stations will be of the capacities of 17,000, 20,500, and 16,500 h.p. respectively.

Italy.—A National Electrification Committee is being formed in Italy, to act under the control of a council representing the private electrical undertakings, Government organisations, technical engineers, and electrical workers' unions.—*Daily Telegraph.*

Norway.—According to the Norwegian Press a proposition is to be put before the Storting recommending the purchase by Buskerad County from the State, of the Halli Waterfall for power generating purposes. The purchase price is Kr. 75,000. H.M. Chargé d'Affaires at Christiania reporting this to the Department of Overseas Trade, notes that the conditions of transfer contain a proviso to the effect that as far as possible the work of harnessing the fall shall be carried out by Norwegian workpeople, and that the material to be used shall be Norwegian in all cases where quality and delivery are as satisfactory as can be obtained from abroad, and when the price is not over 10 per cent. dearer than that of foreign material.

Cookham.—Electric Lighting Scheme.—The Parish Council has decided to support an electric lighting scheme submitted by Mr. George Young, who has laid down an installation at Cookham Mill, and offers a supply of electricity to consumers at 10d. per unit.

Coventry. — Electricity for Houses. — The City Council has sanctioned the laying of mains, at an estimated cost of £4,518, for supplying the working-class houses in course of erection by the Corporation. Applications numbering 185 were reported.

Downton. — Public Lighting.—The Wilts County Council has consented to the Parish Council raising a loan of £650 for the purpose of public lighting by electricity.

Eastleigh.—Application for Provisional Order.—The Urban District Council has decided to apply for a provisional order for electric lighting. There is a probability of electricity being supplied in bulk by Southampton Corporation.

Electricity Districts.—West Riding (Aire and Calder) Inquiry.—A further conference of local authorities included in the West Riding (Aire and Calder) Electricity District took place at Bradford on February 24th. The financial, technical, and legal aspects of the position were approved in principle, and sub-committees were appointed to formulate the necessary steps for submitting the scheme when the inquiry is held in Leeds on April 12th.

Mid-Lancashire.—The Electricity Commissioners have extended the time within which objections or representations relating to the above-mentioned area may be made from September 30th, 1920, to May 31st, 1921.

South-East Lancashire.—In the case of this area the time has already been extended once from October 31st, 1920, to March 31st, 1921, but it has now been further extended to July 30th, 1921.

Enniskillen.—Lighting Scheme Consultant Appointed. —The Urban Council has appointed Mr. T. Tomlinson, electrical engineer, Dublin, to advise on a public electric lighting scheme.

Epsom.—Application for Loan.—Replying to the application of the Urban District Council for a loan of £4,000 for mains and services, the Electricity Commissioners ask what steps the Council proposes to take to improve the financial position of the undertaking, in view of the deficiency of £5,937 for the year 1919-20. The Council has decided to point out the causes, and the fact that the deficiency has now been much reduced.

Glasgow.—Inquiry into Breakdowns.—The attention of the Corporation Electricity Committee has been directed to the recent breakdowns in electricity supply, in letters from the Fairfield Shipbuilding and Engineering Company, and Messrs Harland & Wolff, Diesel Engine Works, Finnieston, who complain of the consequent dislocation of work in their establishments. A Sub-Committee has been appointed to inquire into the whole matter.

Hebden Bridge.—Bulk Supply Inquiries.—Inquiries are being made from the Yorkshire Electric Power Co., Ltd., with respect to the terms upon which it would be prepared to supply the Council with electricity.

Herne Bay. — Commissioners and Gas Co. — The Urban District Council has informed the Commissioners that it has no objection to the revocation of the powers of the Gas Co. with regard to the supply of electricity, on condition that the words, "and electricity" are deleted from the company's registered name.

Huddersfield.—Application for Order.—The Town Council has confirmed a recommendation of the Electricity Committee that application be made to the Electricity Commissioners for a special order under the Electric Lighting Acts, 1882 to 1919, authorising it to supply electricity for all public and private purposes within the urban district of Marsden. It has also been agreed, in the event of the scheme which has been submitted by the Electricity Committee being approved by the Electricity Commissioners, that, if deemed necessary by the Joint Electricity Authority, the generating plant be transferred to such authority on terms to be arranged.

Ilford.—New Sub-Station.—The electrical engineer recommends the erection of a new sub-station in the Broadway and Ilford Lane district, owing to the increased load in this section. The installation will consist of a 500-kW rotary converter, a step-down transformer and the necessary switchgear. The engineer states that, if possible, the station should be completed in time for the next winter's load.

Invergordon.—Electric Lighting Scheme.—An electric lighting scheme is being taken in hand, and the town gas works is consequently to be permanently closed.

Jedburgh.—Inquiry.—A Ministry of Transport inquiry was held last week by Col. T. C. Ekin relative to the application of the Electric Supply Corporation, Ltd., for power to increase the charges for electricity for power and lighting. The application was opposed by a petition from consumers.

Limerick.—Position of Undertaking.—On the re-election for the year of the Electric Lighting Committee, the Mayor said he was glad to be able to announce that within the past few months a saving of £870 had been effected in connection with the undertaking, while there had been a further saving of £200 by the return of unsuitable goods. It was stated at a recent Corporation meeting that the undertaking was in debt to the extent of £23,000.

London.—St. Pancras.—The Electricity Committee proposes to carry out a re-modelling of the mains system in certain areas. This will involve an expenditure of £23,550.

Hackney.—The Borough Council has decided to borrow the sum of £50,000, repayable in 20 years, from the London County Council, for the purpose of extending the electricity undertaking.

Having considered the question of substituting electricity for the present gas lighting, the Works and Open Spaces Committee reports that the present time is inopportune to effect the change, owing to the cost of laying the necessary mains. A sub-committee has been appointed, however, to consider the possibility of instituting electric lighting at a later date.

Fulham.—The Borough Council has decided to accept the offer of £750 by the Battersea Borough Council in settlement of a claim for an additional £2,500, in view of the increased cost of supplying electricity in bulk under an agreement between the two authorities.

The minimum charge to consumers of electricity of 7s. 6d. per quarter has been varied, so that it now stands at 5s. for each of the two summer quarters, and 10s. for each winter quarter.

Melrose.—Proposed Price Increase.—The Electric Supply Co. has applied for power to increase the price of electricity to 1s. 2d. per unit.

Monasterevan (Co. Kildare).—Public Lighting.—The District Council has accepted the tender of Mr. T. Tynan, for the public lighting of the town by electricity at £100 per annum, about 9d. or 10d. in the £, as against 4½d. in former years.

Navan.—Proposed Sale of Station.—The Urban Council has appointed a Committee of the whole Council to deal with a proposal that Messrs. Spicer, local merchants, should lease or sell their new power house for the purpose of a public electric lighting scheme. The firm had intimated that they were willing to part with the plant at a valuation, but there were certain difficulties upon which they thought consultation necessary.

Loan for Electric Lighting Scheme.—The Urban Council directed the clerk to ascertain from the Irish Board of Public Works whether a loan could be obtained for the proposed electric lighting scheme, which is expected to cost between £7,000 and £10,000.

Nova Scotia.—Water-Power Development. — The Nova Scotia Government is engaged in a programme of water-power development. The work is being carried on through the Nova Scotia Power Commission, which was set up for the purpose. The outlay on construction on the first unit, which is now well forward, is about £330,000, and there will also be the cost of expropriation to be added. The claim amounts to £130,000. The present hydro-electric set is exclusively for the City of Halifax, and when complete will supply 30,000,000 kW-hours per year. The expense of development is estimated to be $125 per h.p. The Miller Bros., who have mills on the rivers, claim £350,000, but will not press this if given navigation rights for their logs. This is being done.—*Times Trade Supplement.*

Oldham.—Price Increase Deferred.—The Corporation Electricity Committee has deferred the question of an increase in electricity charges, several members considering that an increase would have a bad effect upon local industry, which is in a state of depression at present. It is pointed out, however, that next year the Committee will have to provide an additional £15,000 to £20,000 on capital charges alone.

Paisley.—New Plant and Mains.—The Electricity Department has received approval of the installation of plant in sub-stations and the laying of new mains, at a cost of about £34,450.

Preston. — Purchase of Undertaking. — The Town Council, on Feb. 24th agreed to the purchase of the National Electric Supply Co.'s undertaking, the total cost of which, it was stated, would reach £286,000. Alderman Margerison said the undertaking had been valued by a representative of the Electric Power Co., on whose figures they were justified in paying the amount stated. The period of repayment would be such as to make the project self-supporting.

Salford.—New Power Station Commenced.—Work is now proceeding on the preparation of the site at Agecroft for the Corporation's large power station. The scheme is expected to cost over a million pounds. About 200 men are engaged in the excavation work.

Yorkshire (West Riding).—Extension of Supply.—The Electrical Distribution of Yorkshire, Ltd., is applying for powers to generate and supply electricity for public and private purposes within the urban districts of Guiseley, Yeadon, Gildersome and districts, Kirkheaton and districts, the urban districts of Knottingley, Adwick-le-Street, Tickhill Darfield, Mont Bretton, and Royston, the rural districts of Thorne, Hemsworth, Pontefract, Doncaster, Rotherham, Wortley, and Kiveton Park, and the parishes of Woolley, Norton, and Carlton, Mytholmroyd, Colne Valley and district, and to amend special orders granted in respect of the urban district of Selby and the parish of Barlby and the urban districts of Stanley, Featherstone, Garforth, Horbury, Otley, Penistone, and Rawdon.

TRAMWAY AND RAILWAY NOTES.

Belfast.—Increased Fares Necessary.—At a recent meeting of the Tramway Committee the general manager submitted the revenue report of the tramways undertaking for the nine months ending December 31st last. This showed a deficit of £22,007 9s. 7d. The town clerk was instructed to impress upon the Ministry of Transport the urgency of having an order issued immediately authorising an increase in fares.

Bolton.—Fare Increase.—The Tramways Committee has decided to increase the fares from April 4th. Bolton is the last tramway authority in the country to take this step. The borough treasurer estimates that for the next financial year the department will require an additional income of £30,000 to ensure that it shall not be a charge on the rates. After six months' working of the new fares the financial position will be reviewed, and if it is found a surplus is likely to be realised, there will be an alteration in favour of the passenger.

Bradford.—Inspection of Railless System.—The tramway manager has received an intimation from the Glasgow tramway manager that a committee from Glasgow is desirous of visiting Bradford to inspect the railless tramway system. Arrangements are being made accordingly.

Application Refused.—The Ministry of Transport has refused the Corporation's application for an extension of powers, under the Bradford Parliamentary Act, to run railless cars on the Idle, Thackley, and Eccleshill sections of the tramway system. Under the Act the local authority has powers to run such cars on certain roads in the city, but the routes in question are not specified, and, therefore, the powers cannot be extended without promoting a new Parliamentary Bill, which could not come into operation until 1923 at the earliest. The proposal to change over to the railless system on this route was made because of the very heavy cost of track renewals. There was a net loss on the nine months' working ending December last of £8,016, but no provision is made for renewals, and, taking an estimate of 3d. per car-mile, it is stated that the actual loss for the period stated totals £47,616. If the Tramways Committee has to undertake the renewal of the track the position will be made much worse. While the reserve fund of the department is still in the region of £145,000, this amount, and much more, will be quickly swallowed up by the essential renewals if the efficient running of the cars is to be guaranteed. The Bradford electric tramways were instituted in July, 1898, and this is the first loss they have incurred.

Brazil.—Railway Electrification.—At a meeting in December, the Paulista Railway Co. resolved upon an increase in the capital of the company from 100,000 contos of reis to 132,000 contos, the expenditure to be incurred in the electrification of the system.

Caledonian Railway.—Suggested Electrification.—A suggestion that the Caledonian Railway Co. should electrify part of its system in Glasgow was made at the meeting of shareholders, last week. Such a scheme, a shareholder thought, would go far to relieve the excessive traffic on the tramways, and might lead to a big addition to the railway funds. Replying, the chairman said that some years ago estimates were obtained for the electrification of the Central Underground and the Cathcart Railway. It was discovered that there would be advantages from electrification, but even then the cost to be incurred made the Board hesitate. The present-day cost was prohibitive. Although they recognised that electrification might be coming, they did not see their way for the necessary financing.

Chester.—Cars *v.* 'Buses.—The Tramways Committee has been discussing the subject of the future policy of the tramway undertaking. The question of relaying the lines, which is necessary if the tramway system is to be continued, or substituting motor-'buses, has yet to be settled. The Committee, at its last meeting, did not come to any decision, as certain figures were required, and the meeting was adjourned.

Colne.—Fare Increase.—It has been decided that the following increased fares shall come into operation on the tramways from March 1st, viz.:—Half-a-mile, 1d.; one mile, 2d.; two miles, 3d.; three miles, 4d.; full route, 5d.; workmen, two miles, 1½d.; children, any distance, 1d. The parcel rates are increased 100 per cent. over the pre-war charges.

Edinburgh.—Electrification Deferred.—In view of the fact that the tramway manager is preparing a report on the whole question, the Corporation Tramways Committee, on February 24th, decided to delay consideration of the proposal to electrify certain portions of the tramway system.

Halifax.—Proposed New Cars.—A Sub-Committee has been appointed to consider and report upon the proposed purchase of new cars.

Loan.—The Tramways Sub-Committee has recommended that borrowing powers be sought for the re-laying of the track, at an estimated cost of £243,222, the amount being made up as follows:—Causeway Foot section, £72,412; Pellon section, £19,504; Hebden Bridge section, £95,881; and West Vale section, £55,425.

Prevention of Accidents.—At the suggestion of the Ministry of Transport, following a recent accident on the tramways, the Tramways Committee has given instructions that "at the top of every gradient opposite the poles marked with the letters 'SL', the slipper brake must be applied in such manner as to have, and maintain, complete control over the car; that at the bottom of each gradient the slipper brake is to be released; that motormen must always be on the alert to drop sand if there is the slightest tendency for the wheels to skid, and that gradients must always be descended as though the worst conditions of weather prevailed, *i.e.*, foggy weather and greasy rail."

Hoylake and West Kirby.—Protest against Increased Fares.—The Council opposes the proposed increase in fares on the Mersey Electric Railway to 2d. per mile, and it has been suggested that it should only agree to the principle of the increase on condition (1) that if the general cost of living comes down within the next few years; (2) that if a scheme for the producing of electricity more cheaply comes into operation, and the railways benefit by cheaper power, the fares shall be reduced.

India.—Calcutta Strike Settled.—A Reuter message dated February 23rd stated:—The tramway strike has been settled on the following basis:—"The men are to resume work to-morrow, the company will investigate the men's grievances forthwith and announce its decision within a week, and finally, if the men are still dissatisfied the Government will constitute a committee of investigation."

L. & S.W. Railway.—Electrification Deferred.—Owing to the enormous cost of the work, it has been decided to defer the electrification of the Cobham and Leatherhead lines. The estimated pre-war cost was £250,000, but it is thought that the present-day cost would not be far short of £1,000,000. The attitude of the Government with regard to the railways is stated to be an additional reason for the decision of the directors.

L. & N.W. Railway.—Electrification.—At the general meeting of the shareholders, the chairman of the company said that the work of electrifying the Queen's Park-Chalk Farm section was being carried on day and night, but progress was necessarily slow, owing to the volume of traffic. It was hoped to open the new lines throughout early next year.

Leeds.—Effect of Increased Fares.—The Tramways Committee has discussed the impending deficiency in the undertaking for the financial year ending March 31st next. When the fares were increased, the deficiency for the first nine months of the year was stated to be £30,500. Some reduction of this amount may result when the whole year's figures are forthcoming, but, nevertheless, there will be a substantial deficit. If the fares are increased further, it is felt that the bulk of tramway users (who reside within the two-mile limit) will refuse to use the cars, and the finances of the undertaking will be still more adversely affected.

New Track.—The Corporation's scheme for the laying of a new tramway for a fast-car service between Harehills and Oakwood will cost £26,650, less the amount of the Government grant and plus £10,300, the amount estimated to be expended by the Improvements Committee. It is calculated that there will be an annual saving of about £650 as the result of the greater speed which will be attainable on the new track.

London.—Labour-Saving on the "Tubes."—Labour-saving devices recently introduced on the Underground Railways include lifts which can be controlled from outside, thus obviating the need for an attendant in the lift. Lifts are being operated in this manner at the Waterloo Station of the Bakerloo line. As soon as passengers have entered the lift the attendant outside manipulates the mechanism, which automatically closes the doors and lowers the lift. On arrival the doors automatically open, and the passengers pass out. Thus one or two attendants can take charge of a group of such lifts.—*Morning Post.*

New Plant.—The L.C.C. Highways Committee recommends the expenditure of £240,000 upon new plant for the Greenwich power station, which supplies the L.C.C. tramways. The amount is made up of the following items:—One 8,000-kW turbo-generator, with all necessary auxiliary plant and switchgear, three boiler units, complete with economisers, superheaters, &c., £210,000; engineers' fees, £10,000, and allowance for foundations and dismantling, and completing works in connection with the boilers, £20,000. In addition to this, £160,000 is to be expended on the reconstruction of the Holborn and Streatham sub-stations, and the purchase of new switchgear and high-pressure cables.

Bermondsey.—In 1914 the L.C.C. Highways Committee prepared to undertake the electrification of horse tramways in the Bermondsey area, but the Government ordered the work to be deferred, as it was not of national importance. The cost at that time would have amounted to about £62,600, plus £22,000 for street widening. The question of proceeding with this work has been raised recently by Bermondsey Borough Council, and the Highways Committee, after due consideration, finds that the present-day cost of the work would be £244,950 for a single track with loops, or £329,850 for a double track (inclusive of street widening costs). The Highways Committee therefore, recommends that the Bermondsey Council be informed that the L.C.C. is unable, at the present time, to see its way to arrange for the electrification of the lines in question.

Oldham.—Application for Time Extension.—The extension of the tramways from Werneth to Chadderton, for which a provisional order was obtained more than 13 months ago, was discussed by the Tramways Committee at its last meeting. The distance is about one and a-half miles, and the original estimate was £25,794. At present it is estimated the cost for track and overhead equipment alone would absorb £48,000. It was also pointed out that motor-'buses were not likely to be a paying proposition. Operating costs per passenger were high compared

with cars, and 'buses could not be run under a cost of 30d. per car-mile. After discussion it was decided to take steps to extend the time in which to carry out the work authorised by the order.

L. & Y. Railway Electrification.—At the annual meeting of the L. & Y. Railway, a suggestion from a shareholder that electrification of a section of the line from Oldham should be carried out as quickly as possible, elicited a reply from the chairman that the directors were satisfied it would be "good business," but money could not be provided for the work at present.

New Zealand. — Municipal Developments. — The *New Zealand Gazette*, No. 99 (January 9th), publishes Orders in Council giving consent to the raising of loans of £1,708,916 by the Wellington City Council for the purposes of water supply, street works, tramways, baths, and general improvements, and a tunnel through Mount Victoria; and £95,000 by the Wanganui Borough Council for the purpose of improving and extending its tramway service.

Gazette No. 102 (December 22nd, 1920) records that Invercargill Borough Council has carried proposals to raise loans including: £25,000 for additions and improvements to railways, and £50,000 for additions and improvements to electric light and power works.

TELEGRAPH AND TELEPHONE NOTES.

France. — Telephone Charges. — In the French Chamber, on February 22nd, M. Paul Laffont foreshadowed the abolition of the present flat rate charge for telephone service in Paris and other large cities, as the French post office had shown a deficit of £20,000,000 on the past year's working.

Italy.—Telegraph Message Tax.—In view of the further adverse rise in the rate of exchange, the present super-tax on telegraphic and wireless messages to foreign countries, when paid in Italian paper money, was raised to 350 per cent. as from March 1st.—*Reuter's Trade Service* (Rome).

Pacific Cable Board.—U.K.-Australia Service.—The Pacific Cable Board announces that it has reinstated the service of week-end telegrams between the United Kingdom and Australia, New Zealand, and the Pacific Islands. The service will be run in conjunction with the Imperial Cable (British Post Office), and telegrams of this class will be accepted at any post and telegraph office as from the 1st inst. The tariffs to Australia and New Zealand are as follows:—Australia, minimum charge covering 20 words, 15s.; each additional word above 20, 9d. New Zealand, minimum charge covering 20 words, 13s. 4d.; each additional word above 20, 8d. Week-end telegrams must have the prefix "TWT" (which is counted and charged for as one word), and the ordinary post-office or Pacific Cable Board's forms may be used.

Press Telegrams.—The Post Office announces that during the International Conferences now being held in London, Press telegrams at reduced rates for the Continent will be accepted at post offices in London at all hours instead of only between the hours of 6 p.m. and 9 a.m. The arrangement took effect from February 24th.

Mr. Illingworth, Postmaster-General, asked in the House of Commons whether he would state how much Press telegrams now cost the country over and above the rate paid for them by the newspapers, and whether, in the interests of economy, he intended to alter the present subsidy system, said that no recent investigation had been made as to the cost of Press as distinct from ordinary telegrams, but the loss was no doubt considerable. The rates for Press telegrams were increased on January 1st, 1920, and he did not contemplate a further increase at the present moment. The rates for private wires leased to the Press and to news agencies were, however, about to be raised.—*The Times.*

Swatow.—Cable Communication.—Attention is being given to the need of cable communication for Swatow and a scheme for providing such communication will probably be taken in hand. As a result of military operations in China, the only telegraphic connection of Swatow with the outside world was recently interrupted for three months. Therefore, telegrams reached Swatow only by post from Hong-Kong. Commenting upon this situation, Consul Myers, of Swatow, calls attention to the effect upon business of such interruption, stating further that Swatow has no cable connection. Three lines of the Chinese Telegraph Administration touch at Swatow, but the service at its best is very poor, the lines are not kept in good condition, and interruptions are frequent in bad weather. The unreliable nature of this service, therefore, points to the laying of a cable to Swatow as the only solution. In view of the commercial future of the port, whose trade is twice that of Amoy and Foochow combined, which ports have cable services, the demand for dependable telegraphic cable communication is apparent.—*Indian Engineering.*

Sweden.—Automatic Telephony.—A short time ago a party of Swedish State telegraph experts returned from a visit paid to Germany in order to investigate the subject of automatic telephone exchanges. According to a Swedish newspaper, the Siemens system, which was studied, is said certainly to "work in its own way." But when the percentage of wrong connections amounts to 14, as compared with 2½ per cent. with the manual system used in Stockholm, there is little inducement for the experts to recommend the introduction of the automatic system before it can be proved to be more reliable in working. In some towns in Germany it is declared that subscribers have lodged mass protests against the automatic telephone service, and demanded the reintroduction of the manual system. The question was previously examined by the Swedish experts in the United States, but it was found difficult to get any real insight into the degree of reliability of the automatic system.

Telephone Service.—Existing Contracts.—In reply to a question in Parliament whether a subscriber to the telephone is to be forced to continue his contract with the Post Office till the end of the period of his contract at the new rates, or if he could give up the use of the telephone, Mr. Illingworth wrote in reply that, unless specially provided for otherwise, a subscriber whose contract under the old rates is still current cannot be required to pay the new rates until the contract has been determined, and he can then decide whether he will enter into an agreement at the new rates, which in the case of an existing subscriber would run from quarter to quarter.

U.S.A.—Cable Dispute.—A decision was given in favour of the company, on February 25th, in the action brought by the Western Union Telegraph Co., against the U.S. Government, to restrain the latter from interfering with the landing of a cable at Miami, Florida.—*Daily Mail.*

Police Use Wireless.—Wireless telegraphic apparatus has been installed at the New York police headquarters as a means of notifying the police of other cities concerning the movements of suspected criminals. The messages will cover a radius of about 300 miles, and transmission will take place every evening from 6 p.m. until midnight.

Wireless D.F. Stations.—An Air Ministry Notice to Airmen (No. 17 of 1921) gives a list of wireless direction finding stations, together with the latitude and longitude of each, the call signal, wave length, and other details. In the British Isles there are nine stations, namely, at Amlwch, Rhyl, Berwick, Carnsore, Croydon, Flamborough, Lizard, Malin Head, and Sea View; in France there are 16, the erection of five others being contemplated; in Germany four; and in Italy one. The notice contains full instructions concerning the procedure to be used when communicating with the stations.—*The Times.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Melbourne.—April 19th. P.M.G. Telephone switchboards (Schedule No. 1 670).* (February 25th.)

April 27th. Victorian Railway Commissioners, Spencer Street. Caustic soda primary cells, complete (Contract No. 33,914).*

Brisbane.—March 30th. P.M.G.'s Department. Switchboard apparatus and parts.*

Ballinrobe.—March 15th. Ballinrobe Electricity Supply Co., Ltd. Erection of poles and overhead line in connection with the electric lighting supply. (See this issue.)

Belgrade. — May 1st. The Commercial Secretary to H.M. Legation at Belgrade has forwarded to the Department of Overseas Trade particulars of a call for tenders by the Serb, Croat, and Slovene Ministry of Public Works, for the erection of a power-station, main conductors and transforming stations in connection with an electrical scheme at Kostolac for the supply of energy to Belgrade, Semlin, &c. Tenders should be addressed to the Director, Ministry of Public Works, Belgrade. A translation of the specification and conditions of tender, together with a plan showing the disposition of the various stations and lines, may be inspected at Room 48, Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Bradford.—Electric lighting installation at Great Horton Wesleyan Schools. Mr. E. Ramsden, Cliffe Mills, Great Horton, Bradford.

Croydon.—March 7th. Electricity Department. Two natural draught cooling towers. (February 18th.)

Dewsbury.—Electric-light installation in branch shops, Brewery Lane, Thornhill Lees, for the Dewsbury Pioneers Industrial Society, Ltd., Union Street, Dewsbury.

Dungarvan.—Co. Waterford. — March 10th. Dungarvan Electric Light and Power Co., Ltd. Wiring of consumers' premises in connection with the electric lighting scheme. J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin.

Edinburgh. — Parish Council. Supply of intercommunication telephone instruments and accessories for Craiglockhart Poorhouse. Mr. R. T. French, Clerk, Parish Council Chambers.

Glasgow.—March 11th. Education Authority. Installation of electric lighting and heating systems in a number of schools. Schedules on application to Property Department, 129, Bath Street.

Johannesburg. — March 30th. Municipal Council. Forty 50-h.p., 500 to 600-V tramcar motors. Tenders to Town Clerk, Municipal Offices, Johannesburg. A copy of the specification may be seen in Room 48 of the Department of Overseas Trade up to to-morrow (Saturday), after which date it will be available for loan to firms in the provinces.

Leeds.—March 8th. Electrical work required in the Education Committee's schools for the year ending March 31st, 1922. Architect, Education Department, Calverley Street.

Macclesfield.—March 14th. Cheshire County Asylum, Parkside. Stores, including electrical goods, for six months. W. G. F. Tingay, Clerk.

Manchester.—April 4th. Electricity Committee. 33,000 and 6,600-V switchgear, induction regulators, &c., for controlling sub-stations of large capacity. (February 18th.)

Perth. — March 21st. Electricity Department. One 1,000-kW, d.c., geared turbo-generator, with condensing plant. (See this issue.)

Plymouth.—March 7th. Electricity Department. Cast-iron pipes. (See this issue.)

Rhondda.—April 5th. Electricity Department. A.c. house service meters, cable, joint boxes, &c. (February 25th.)

Spain.—The War Minister has been authorised to invite tenders for the supply of radio-telegraphic material for the first Regimento de Telegrafos and the Batallon de Radiotelegraphie. The estimated cost is 300,000 and 500,000 pesetas respectively.—*Reuter's Trade Service* (Madrid).

Stockton-on-Tees. — March 9th. Electricity Department. A.c. l.p. switchgear. (February 25th.)

Uruguay.—Monte Video.—March 29th. State Power House. Single and three-phase meters.*

March 31st. A telegram from H.M. Minister at Monte Video (Sir C. C. Mallet, C.M.G.), to the Department of Overseas Trade, states that general tenders are invited until March 31st for the construction of the projected port works at Paysandu, for which an expenditure of $280,457.30 has been sanctioned. The construction of a dyke, the acquisition of electrical handling and lifting apparatus, the extension of the mole and the construction of anchoring grounds, are included in the scheme.

* A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—Sydney.—Electricity Supply Committee.

Eighteen 400-kVA transformers, £17,091.—English Electric Co. of Australia, Ltd. (recommended). —*Tenders.*

Belgium.—No fewer than twelve firms—Belgian, French, German and British—submitted tenders recently to the municipal authorities of Schaerbeek, Brussels, for the supply of three static three-phase transformers. The lowest tender was that of the representatives of a German manufacturer, the Comptoir Générale d'Electricité d'Allemagne, of Brussels, who quoted 18,753 francs per transformer.

Government Contracts.—The following Government contracts were placed during January, 1921 :—

Admiralty (Contract and Purchase Department).

Battery.—Fuller's United Electric Works, Ltd.
Carbon rods.—Morgan's Crucible Co., Ltd.
Secondary cells.—Fuller's United Electric Works, Ltd.
Electric Lighting at Rosyth.—G. E. Taylor & Co.
Motor generators.—W. H. Allen, Sons & Co., Ltd.
Switchgear.—Whipp & Bourne, Ltd.

War Office.

Distributing boards.—General Electric Co., Ltd.; W. Sanders & Co.

Air Ministry.

Storage Battery.—Pritchett & Gold, Ltd.
Electric mains.—Callender's Cable Co., Ltd.
Electrically-driven fire pump.—Allen, Sons & Co.

Post Office.

Telephone apparatus.—Sterling Telephone & Electric Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; London Electric Wire Co. & Smiths, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Lamp caps.—J. Hannan.
Casing and cover.—McGaw & Co.
Secondary cells.—Van Raden & Co., Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; Phœnix Telephone & Electric Works, Ltd.
Cut-outs.—Johnson & Phillips, Ltd.
Ducts.—Albion Clay Co., Ltd.
Electro-mechanical gate locks, gate contacts, and lattice gates for lifts at various P.O. buildings.—Medway's Safety Lift Co., Ltd.
Insulators.—De la Rue & Co., Ltd.
Electric lamps.—English Electric & Siemens Supplies, Ltd.
Laying conduit.—Grove Road, Burdett Road, and West India Dock Road: Whittaker Ellis, Ltd. Harrow (Pinner Road): G. J. Anderson. Hunton Bridge, Berkhampstead: H. Farrow. Manchester-Hyde-Glossop and Oldham-Huddersfield (section III): W. Turner (Ardwick). Newcastle-Durham (section III): Kettle & Son. Southampton-Totton: W. Dobson.
Manufacture, supply, drawing in, and jointing cable.—London-Barnet: Callender's Cable & Construction Co., Ltd. London-Brighton: Johnson & Phillips, Ltd. Leeds-Harrogate: British Insulated & Helsby Cables, Ltd.
Mouthpieces for telephones.—Crystalate Manufacturing Co., Ltd.
Power plant and electric lighting North Walsham relay station.—G. E. Taylor & Co. Sub-contractors: For battery, Tudor Accumulator Co., Ltd. For engine and generator, R. A. Lister & Co., Ltd.
Power equipment, Dollis Hill Wireless Experimental Station.—Westminster Engineering Co., Ltd. Sub-contractors: For induction motor, Lancashire Dynamo & Motor Co., Ltd. For static transformer, Johnson and Phillips, Ltd. For auto-transformer starter, Electrical Apparatus Co., Ltd.
Electric trucks.—English Electric Co., Ltd.
Bronze wire.—Shropshire Iron Co., Ltd.
Telephone exchange equipment.—Belfast: Western Electric Co., Ltd. Paisley: Automatic Telephone Manufacturing Co., Ltd. New Barnet: Peel-Conner Telephone Works, Ltd. Sub-contractors: For batteries, Tudor Accumulator Co., Ltd. For charging set and ringing dynamotor, Crompton & Co., Ltd.
Annealed copper wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., incorporated in the London Electric Wire Co. & Smiths, Ltd.
H.d. copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., incorporated in the London Electric Wire Co. & Smiths, Ltd.; J. Wilkes, Sons & Mapplebeck, Ltd.
Galvanised steel wire.—F. Smith & Co., Wire Manufacturers, Ltd.

High Commissioner for India.

Electric battery.—Tudor Accumulator Co., Ltd.
Insulator cups.—Bullers, Ltd.; Edwardes, Bros.; Taylor, Tunnicliffe and Co., Ltd.
Insulators.—Bullers, Ltd.
Electric lamps.—General Electric Co., Ltd.
Meters.—Weston Electrical Co., Ltd.
Motors.—Lancs. Dynamo & Motor Co., Ltd.
Pelaphone plant.—New Pelaphone Engine Co., Ltd.
Power plant.—General Electric Co., Ltd.
Switchboards.—British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.
Telephone apparatus.—Peel-Conner Telephone Works, Ltd.
Copper wire.—T. Bolton & Sons, Ltd.; Elliotts Metal Co., Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Ltd.
G.i. wire.—F. Smith & Co., Ltd.

Crown Agents for the Colonies.

Cable.—British Insulated & Helsby Cables, Ltd; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Western Electric Co., Ltd.
Copper wire cable.—Hooper's Telegraph & I.R. Works, Ltd.
Electric lamps.—Metropolitan-Vickers Electric Export Co., Ltd.
Insulated wire.—Hooper's Telegraph & I.R. Works, Ltd.
Jointing materials.—W. T. Henley's Telegraph Works Co., Ltd.
Switchboard materials.—Siemens Bros. & Co., Ltd.
Switchgear.—Metropolitan-Vickers Electric Export Co., Ltd.
Telegraph line material.—Bullers, Ltd.; Siemens Bros. & Co.
Telephones.—British L. M. Ericsson Manufacturing Co., Ltd.
Transformers.—Metropolitan-Vickers Electric Export Co., Ltd.

H.M. Office of Works.

Engineering services.—Electric lift, National Portrait Gallery: Medway's Safety Lift Co., Ltd.

London. — Stepney.—Electricity Supply Committee. Accepted :—

One 1½-ton Garrett patent electric vehicle, £1,000.—Agricultural and General Engineers, Ltd.
Coal—8,000 tons Seghill/Hastings nutty smalls, 43s. 6d. ton.—E. Foster & Co.
Cable—250 ft. ·3 sq. in., 200 yds. ·25 sq. in. e.h.p. 3-core cable, and 440 yds. ·2 sq. in. t.c.l.e. cable.—W. T. Henley's Telegraph Works Co., Ltd.
½ mile troughs and covers, £126.—Sutton & Co.

Bethnal Green.—Electricity Committee. Accepted :—

50 ·20-amp., 24 ·40-amp. 2-200-amp. meters (total), £345.—Metropolitan-Vickers Electrical Co., Ltd.

Manchester.—Electricity Committee. Accepted :—

Cable—British Insulated & Helsby Cables, Ltd; Western Electric Co, Ltd.; motor-driven pumping plant for Barton power-station, Mather & Platt, Ltd.; sub-contractors: Valves, Glenfield & Kennedy, Ltd.; oil switches, G. Ellison; switchgear, Metropolitan-Vickers Electrical Co., Ltd.

Nelson.—According to the Manchester *Daily Despatch*, the Town Council on Tuesday discussed the letting of a tender for tram crossings and points to the Anglo-Belgian Improvement Corporation. As chairman of the Tramways Committee, Alderman Cooke said the price was 50 per cent. lower than the tender of any English firm. It appears that the representative of the firm, on submitting the tender, said a deputation of their workpeople had waited on them and agreed to work the full six days a week, including Saturday afternoons, without demanding overtime. This was one reason why Belgian firms were able to undercut.

Portrush.—Urban District Council. Accepted :—

Plant for electricity supply, £13,598.—Messrs. Curran.
Building generating station, £1,653.—Cochrane & Elliott.

Salford.—Electricity Committee. Accepted :—

L.p. single paper-insulated, lead-covered cable, £381; 4-core l.p. cable, £980.—Pirelli-General Cable Works, Ltd.
L.p. twin paper-insulated, lead-covered cable, £249; l.p. concentric paper-insulated, lead-covered cable, £963; e.h.p. 3-core, paper-insulated, lead-covered cable, £347.—W. T. Glover & Co., Ltd.
D.c. switchgear for 1,000-kW rotary converter at Blackfriars sub-station, £444.—Bertram Thomas.

FORTHCOMING EVENTS.

Birmingham and District Electric Club.—Friday, March 4th. At the Grand Hotel, Birmingham. At 6.45 p.m. Annual dinner.

Saturday, March 12th. Paper on "Common-sense Methods of Recording Costing and Progress in Shop Management," by Mr. H. C. Young.

British Electrical Development Association (Inc.).—Friday, March 4th. At the Offices of the British Electrical and Allied Manufacturers' Association, 36, Kingsway, W.C.2. At 12 noon. Adjourned first annual general meeting.

Institution of Mechanical Engineers.—Friday, March 4th. At the Institution, Storey's Gate, S.W. At 6 p.m. Paper on "De-gassing and Purification of Boiler Feed-water," by Mr. P. Kestner.

Royal Institution of Great Britain.—Friday, March 4th. At Albemarle Street, Piccadilly, W. At 9 p.m. Lecture on "Severn Crossings and Tidal Power," by Mr. W. A. Tait.

Saturday, March 5th. At 3 p.m. Lecture on "Electricity and Matter," by Sir E. Rutherford, F.R.S. (Lecture I.)

Royal Society of Arts.—Monday, March 7th. At John Street, Adelphi. At 8 p.m. Cantor Lecture: "X-Rays and their Industrial Applications," by Major G. W. C. Kaye.

Chief Technical Assistants' Association.—Saturday, March 5th. At Anderton's Hotel, Fleet Street, E.C. At 3 p.m. Annual general meeting.

Salford Technical and Engineering Society.—Saturday, March 5th. At the Royal Technical College. At 7 p.m. Paper on "The Barton Electric Power Station," by Mr. S. L. Pearce.

Institution of Post Office Electrical Engineers (London Centre).—Monday, March 7th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 5.30 p.m. Paper on "The Relay System of Automatic Switching," by Mr. H. Dipple

Society of Engineers.—Monday, March 7th. At Burlington House, Piccadilly, W. At 5.30 p.m. Paper on "Some Modern Engineering Practice in America," by Mr. R. W. A. Brewer.

University of London.—Monday, March 7th; Wednesday, March 9th, and Friday, March 11th. At the Institution of Civil Engineers, Great George Street, S.W. At 5.30 p.m. Lectures on "Recent Engineering Works in Italy," by Prof. Luigi Luiggi, Professor of Hydraulic Construction in the University of Rome.

Institution of Civil Engineers.—Tuesday, March 8th. At the Institution, Great George Street, S.W. At 5.30 p.m. Paper on "The Amritsar Hydro-electric Irrigation Installation," by Mr. S. Leggett.

Electricity District Inquiry.—Tuesday, March 8th. At Liverpool. Resumed inquiry by the Electricity Commissioners into the Mersey and West Lancashire District.

Association of Engineers-in-Charge.—Wednesday, March 9th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Paper on "The Economic Utilisation of Exhaust Steam," by Mr. A. J. Assheton.

Institute of Cost and Works Accountants.—Wednesday, March 9th. At the Institute of Patent Agents, Staple Inn Buildings, W.C. At 7 p.m. Lecture on "Economics in Relation to Costing," by Mr. W. Grainger.

Institute of Metals.—Wednesday and Thursday, March 9th and 10th. At the Institution of Mechanical Engineers, Storey's Gate, Westminster. Annual general meeting.

Manchester Wireless Society.—Wednesday, March 9th. At the Manchester College of Technology, Sackville Street. At 7.30 p.m. Lecture on "The Construction of Electric Motors," by Mr. R. Haliam.

National Association of Supervising Electricians.—Wednesday, March 9th. At 6.30 p.m. At St. Bride's Institute, Bride Lane, E.C. Discussion on "Gas v. Electricity." Opened by Mr. F. W. Goodenough and Mr. W. A. Gillott.

Association of Engineering and Shipbuilding Draughtsmen (York Technical Section).—Thursday, March 10th. At 7.15 p.m. At the Priory Street Higher Grade School, York. Paper on "Wireless Telegraphy," by Mr. E. Backhouse.

Belfast Association of Engineers.—Thursday, March 10th. At the Municipal Technical Institute. At 6.45 p.m. Paper on "Technical Training for Industry," by Mr. A. P. M. Fleming.

Chelmsford Engineering Society.—Thursday, March 10th. At the East Anglian Institute of Agriculture. At 7.15 p.m. Paper on "Ball and Roller Bearings," by Mr. T. W. Cooper.

Institution of Electrical Engineers.—Thursday, March 10th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Lecture on "Magnetic Susceptibility of Low Order." Lecture III—"Practical Applications," by Prof. E. Wilson.

Students' Section.—Friday, March 11th. At King's College, Strand, W.C. At 6.30 p.m. Paper on "Some Recent Developments in Converting Machinery for Small Sub-stations," by Mr. J. A. Broughall.

Western Centre.—Monday, March 7th. At the South Wales Institute of Engineers, at Cardiff. At 7 p.m. Lecture on "The Prospects of Electricity in Agricultural Centres," by Mr. W. Kerr.

North-Midland Centre.—Tuesday, March 8th. At the Hotel Metropole, Leeds. At 7 p.m. Ordinary meeting.

North-Western Centre.—Tuesday, March 8th. At the Engineers' Club, Manchester. At 7 p.m. Paper on "Electric Driving in the Paper Mill on Heat-economy Lines," by Mr. A. B. Mallinson.

Scottish Centre.—Tuesday, March 8th. At Princes Station Hotel, Edinburgh. At 7 p.m. Lecture on "The Long-distance Telephone System of the United Kingdom," by Sir W. Noble.

Scottish Centre (Students' Section).—Friday, March 11th. At the Royal Technical College, Glasgow. Paper on "Machinery Operations in Automobile Construction," by Mr. R. J. Hird.

Edinburgh Electrical Society.—Friday, March 11th. At the Philosophical Institute. At 8 p.m. Apprentices' night. Short papers on "Every-day Work" for the Society's prize.

Junior Institution of Engineers.—Friday, March 11th. At 99, Victoria Street, S.W. At 8 p.m. Lecturette: "Electrical Drive in the Cotton Trade," by Mr. A. T. McGuire.

Physical Society of London.—Friday, March 11th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Sixth Guthrie Lecture: "Some Recent Applications of Interference Methods," by Prof. A. A. Nicholson, University of Chicago.

NOTES.

The New Sessions House of the L.C.C.—We regret that in our reference to the four-contact suspension of the large fittings, in our last issue, the makers' name was incorrectly stated; it should read "The London Electric Firm."

Summer Time.—Mr. Shortt stated in the House of Commons on February 23rd that the Government proposed to introduce summer time this year from midnight on Saturday-Sunday, April 2nd—3rd, to midnight on Sunday-Monday, October 2nd—3rd.

Summer-time will be re-established in France on the night of March 4th, and all restrictions on the use of electricity will then be removed, says the *Daily Telegraph*.

Twenty-Four Hours' Clock.—Mr. Shortt (Home Secretary) informed the House of Commons on February 22nd that the Government had decided to take no steps at present with reference to the adoption in general use of the 24 hours' clock system.

Service Notes.—Seven mechanist electricians with a knowledge of wireless telegraphy are required for the Indian service—a two years' engagement, 350 rupees per month, free quarters or allowance in lieu thereof, free medical attendance, and free passage outwards.

Warrant-electrician W. G. P. Whiting has been posted to the battleship *Iron Duke*, from the 9th inst. Warrant-telegraphist C. C. France has been posted to the *Iron Duke* for service with the squadron of which she is the flagship.

B.T.H. Wireless Apparatus.—With reference to our notice of the B.T.H. Co.'s stand at the Efficiency Exhibition at Olympia (page 232 of our February 25th issue), we have been asked to correct the statement that the portable wireless telegraphic receiving set that was shown "needed an aerial." The main feature of the set is that messages can be received in any reasonably quiet room without the aid of an aerial.

"A Question of Ethics."—As we go to press the following letter has come to hand:—

"I have read with interest W. A. Moore's letter in your issue of February 25th; but, in view of the fact that the page number of the *write-up* appeared in the *advertisement*, I am afraid your explanation in the footnote does not carry much weight. If there was no connection whatever between the advertisement and the write-up, and no knowledge on the editorial side, I can only congratulate the advertisers on their apparent uncanny foresight in fixing the correct page number in the news columns.

"W. Mahoney."

"*March 2nd*, 1921.

The matter is really very simple. Both the editorial and the advertisement pages pass through the hands of our foreman printer, who, of course, knows the numbers and contents of all of them. We understand that the copy for the advertisement in question was received at the last minute and hurriedly forwarded to him without critical inspection, and he inserted the page number without instructions to do so. The advertisement manager and the editors knew nothing about the matter till after publication.

Electrical Engineers' Reunion.—No. 5 Company London Electrical Royal Engineers (T.F.) will hold their annual dinner at Queen's Hotel, Leicester Square, on Saturday, March 19th. Particulars may be obtained from the Secretary, Mr. G. Pressy, 3, Rugby Road, Chiswick, London, W.4.

The Geo. Montefiore Endowment.—The next awards in connection with the above endowment, details of which were given in our pages some months ago, will be made this year. A prize or prizes not exceeding 20,000 fr. in value will be awarded for the best paper or papers, which must have been prepared within the last three years, and may be in French or English, dealing with scientific developments or improvements in the technical applications of electricity. The closing date for entries is April 30th next, and the offices of M. le Secrétaire Archiviste de la Fondation Geo. Montefiore, are at Rue Saint-Gilles, 31, Liége, Belgium.

A Gas Comedy.—Because of the poor gas supplied, says the *Daily Mail*, Middlesex County Council has agreed to install electric light at the gas-meter testing station at Edmonton to enable the inspector to do his work.

Trains on Fire.—According to the *Daily Mail*, five trains were involved and nine carriages destroyed in a fire at the Caledonian Railway Co.'s cleaning sheds, Glasgow. Several carriages were drawn out of the danger zone by engines. Some of the destroyed carriages had only arrived from London the previous night. The fire spread rapidly owing to the explosion of gas tanks.

The sting is, as often happens, in the tail. Electrically-lighted trains are not liable to explosions.

Appointments Vacant.—Shift engineer (£314), meter fixer (80s. 4d.), for the Eccles Corporation Electricity Department

The Three-Shift System in the Cable-Making Industry.—According to *The Electron*, the National Joint Industrial Council for the Cable-Making Industry has decided to recommend to all factories where overtime is being worked, the introduction of the three-shift system.

Fatality.—While repairs were being carried out to the chimney stack of the Lister Drive Power Station, Liverpool, a steeplejack, supposed to have missed his footing on the scaffolding, fell a distance of from 80 to 100 ft. and was killed instantly.

Educational.—University of London.—A course of six public lectures on "Recent Engineering Works in Italy," will be given at the Institution of Civil Engineers, Great George Street, S.W., by Prof. Luigi Luiggi, D.Sc., M.Inst.C.E., Professor of Hydraulic Construction in the University of Rome, at 5.30 p.m., on March 7th, 9th, 11th, 15th, 16th, and 18th, 1921. The subjects dealt with will be:—Sanitary Engineering and Water Supply; Agricultural Hydraulic Engineering; Industrial Hydraulic Engineering (Hydro-Electrical Power Development in the Alps and Apennines, Applications of Electricity to Steel and Copper Refining Works, Chemical Engineering Works, Utilisation of Volcanic Heat for Steam Raising); Transportation Engineering (Italian Canals, Roads, Railways, and Air Transport).

The lectures, which will be given in English and fully illustrated with lantern slides, are addressed to advanced students of the University and others interested in the subject. Admission will be free, without ticket.

In view of the age-long pre-eminence of Italian engineers in hydraulic engineering, this course is sure to be of the greatest interest and value to British engineers.

An Auto-Pram.—We are informed that the Rev. Percival Mackenzie, of Forest Hill, is responsible for the invention of an auto-pram. He has fitted an electric motor, made from a self-starter taken from a motor-car, to his children's perambulator. The motor is fed from a battery of accumulators, and is so geared that while there is, it is stated, no danger of breaking the speed limit for perambulators on the level, it will climb a hill with ease and save nurse having to exert herself unduly. Affixed to the side of the pram in a conspicuous position is a motor licence!

INSTITUTION NOTES.

Institution of Electrical Engineers.—Summer Meeting.—With reference to our last week's note on this subject, we are informed that the first two days will be spent in Glasgow, when visits will be paid to the new power station at Dalmarnock, and to works and other places of interest. There will also be papers on that power station and on the hydro-electric power resources of Scotland. Arrangements have been made for a Clyde trip on June 8th. On the 9th the party will proceed by special train to Fort William or Banavie (Inverness Canal), and on the following day a steamer will take the visitors down Lock Linnhe to Kinlochleven, where the hydro-electric installation of the British Aluminium Co. will be visited. In the afternoon the steamer will continue its journey southwards and land the party at Oban, where the visit will end on Friday evening, June 10th. The journey to Fort William and thence to Oban will give an opportunity of seeing the most magnificent scenery of the Western Highlands.

The December, 1920, issue of the Institution *Journal* contains, *inter alia*, particulars regarding the Membership Advisory Committee for India, of which Mr. J. W. Meares (Simla) is chairman and Mr. C. C. T. Eastgate (Lahore) is secretary. It also contains a complete list of the members of the 12 Committees appointed by the Council for 1920-21, and of the representatives of the Institution on other bodies.

North-Western Centre.—A meeting of the members of this Centre was held on February 22nd, Mr. Julius Frith presiding. Mr. E. A. Watson read his paper on "Magnetos for Ignition Purposes in Internal Combustion Engines," which he freely illustrated with lantern slides. In the discussion, the chairman, Prof. E. H. Crapper, Dr. Garrard, and Messrs. G. A. Cheetham, J. W. Naylor, H. D. Symons, D Paton, and Sills took part.

Wireless Section.—A meeting of the Wireless Section will be held on Wednesday, March 16th, at 6 p.m., at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W., when the following papers will be read and discussed:—"On the Effect of Electron Emission on the Temperature of the Filament and Anode of a Thermionic Valve," by G. Stead, M.A.; and "On Some Thermionic Tube Circuits for Relaying and Measuring," by Miss W. A. Leyshon and Dr. W. H. Eccles.

Liverpool Sub-Centre of the North-Western Centre.—Mr. G. A. Juhlin read his paper on "Temperature Limits of Large Alternators," before the Liverpool Sub-Centre, on February 28th. In opening the discussion which followed, Mr. Hollingsworth welcomed the paper from the user's point of view, and thought that, in general, supply engineers were not adverse to the installation of temperature detectors, as he was of opinion that they had everything to gain. Also the general installation of detectors would aid both manufacturers and the users.

Mr. Teago thought that the temperatures mentioned were not revolutionary, and suggested that the temperature should be measured on the end windings rather than in the core, since the end windings represented the weakest spot.

Dr. Marchant suggested an interesting device for determining the temperature with the aid of a potentiometer. Mr. Malpas pointed out various difficulties that he had come in contact with, and a few questions were asked by Mr. Rettie; finally Mr. Juhlin suitably replied.

National Association of Supervising Electricians. — On Wednesday next, March 9th, there will be a discussion on "Heating, Power, Lighting, and Cooking—Gas *v.* Electricity"; Mr. F. W. Goodenough, nominated by the British Commercial Gas Association, will present the case for gas, and Mr. W. A. Gillott, nominated by the British Electrical Development Association, will be the advocate of electricity. Mr. J. S. Highfield, president, will occupy the chair, and a lively discussion may be anticipated. The address of the Hon. Secretary of the N.A.S.E. is 83, Deodar Road, S.W. 15, and we have no doubt that he would be pleased to send tickets to electrical engineers who would like to hear the debate and who apply to him for them.

The Royal Society—On February 17th a paper was read by Dr. C. Chree, F.R.S., on "A Comparison of Magnetic Declination Changes at British Observatories." Prof. H. M. Macdonald, F.R.S., read a paper on "The Transmission of Electric Waves Around the Earth's Surface."

Portsmouth Rotary Club.—On February 22nd, Captain W. H. Upton-Marshall R.E.(T.), M.I.E.E., M.I Mech.E., read a paper to the members of this club on "How Electricity Helped to Run the War, and Its Future Possibilities as a Civilising Agent." Having broadly covered his subject, the speaker referred to the reorganisation of electricity supply. He passed some severe criticism on the Portsmouth Electricity Department, whose generating costs, he said, were double those of any other station of comparable size in this country. He sketched a supply scheme for Portsmouth and its environs, suggesting the erection of a large generating station at Hilsea, which occupies a favourable position as regards coal and water supplies.

Association of Mining Electrical Engineers.—At a meeting of the West of Scotland branch of the Association, at Glasgow, on February 18th, Mr. F. Anslow presiding, a paper was read by Mr. S. Burns, of Newcastle, on "The Choice of a Small Electric Winder." During the discussion which followed the reading of the paper, Mr. F. Anslow, the president, remarked that electric winding was now beyond the realms of speculation. That cleared the way for complete electrification, which was a matter of national importance.

Society of Engineers (Incorporated).—At the meeting in the Apartments of the Geological Society, Burlington House, W., on Monday, March 7th, at 5.30 p.m., a paper will be read on "Some Modern Engineering Practice in America," by Mr. Robert W. A. Brewer, A.M.Inst.C.E. The subjects dealt with will include the construction of large concrete-lined oil reservoirs, the manufacture of vacuum valve amplifiers for wireless telephony, and the Cottrell process of precipitation of smoke and fumes.

A New Wireless Society.—At a recent meeting held at the Wimbledon Technical Institute, at which Mr. H. Nutton, A.M.I.E.E., presided, the formation of a wireless society for Wimbledon and district was decided upon. Mr. W. A. Harwood, Principal of the Institute, was elected president, and Mr. W. G. Marshall, 48, Warren Road, Merton, S.W., as the hon. secretary. Monthly meetings are to be held, and the first will take place to-morrow, March 5th, when the President will deliver the opening address.

Edinburgh Electrical Society.—At a meeting held on February 25th, a paper on "Telephone Troubles" was read by Mr. J. McEwan Brown, of the Government telephone service. The paper advocated first a thorough knowledge of the principles and functions of telephonic apparatus, and then a systematic division of an installation with sections for fault tracing. The most common failures and the measures taken to cure them were described. An interesting discussion followed.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

At a conference of the district engineers of East Anglian Electricity, Ltd., Mr. A. E. Iliffe, the district manager for the Waveney Valley, was presented with a silver cigarette case by the directors and staff, on the occasion of his resignation from the company to take up his duties in the Domestic Heating and Cooking Department of the Metropolitan-Vickers Electrical Co., Ltd. Mr. Napier Prentice made the presentation.

Messrs. H. W. Smith & Co. (1920), Ltd., have engaged Mr. D. C. Jewell, who was for a long time with Messrs. Sir W. Armstrong, Whitworth & Co., Ltd., at their Elwick Works, as their representative for the North-Eastern Counties.

Stepney Borough Council General Purposes, Staff, and Education Committee, having further considered the reference from the Electricity Committee that the salary of Mr. A. J. Squire, deputy (commercial) manager be increased to that paid to Mr. Young, the resident electrical manager (excluding the value of Mr. Young's emoluments), entirely concurs in the recommendation. Mr. Young's present salary is at the rate of £777 per annum.

Chesterfield Town Council has increased the salary of Mr. W. A. Toppin, general assistant engineer in the electricity and tramways department, to £547 a year, without prejudice under the Civil Service awards.

Sir Ernest V. Hiley has resigned the chairmanship of the Metropolitan Carriage, Wagon, and Finance Co. He still retains his position as a director of the company, and his resignation as chairman has nothing whatever to do with Messrs. Vickers, Ltd. It is stated to be purely a domestic arrangement in the management of the Metropolitan Co.

Mr. Lincoln Chandler has been re-appointed managing director of the Metropolitan Co., a position which he relinquished 12 months ago.

Mr. H. E. Mortimer has resigned his position as contracts engineer with Messrs. Edmundson's Electricity Corporation, Ltd., and has joined the Board of Messrs. Baxter & Caunter, Ltd., 819, Tottenham Court Road, W. 1.

Prof. William A. Bone, F.R.S., Professor of Chemical Technology at the Imperial College of Science and Technology, South Kensington, underwent a serious operation last week, and is at present passing through a critical period of recovery. He has cancelled all his engagements.

Sir John Monash has been appointed chairman of the Electricity Commissioners, under the Australian State Electricity Commission Act, at £3,000 per annum, for seven years. The other Commissioners are:—Prof. T. R. Lyle, Mr. G. Swinburne, and Sir Robert Gibson, for seven years, at £500 per annum each.

Obituary.—Mr. C. Surman.—We regret to record the death of Mr. Charles Surman, who up to his retirement was chief superintendent of telegraphs at the Liverpool General Post Office.

Mr G. R. Peers.—We learn that the death of Mr. G. R. Peers, which we announced a fortnight ago, occurred suddenly from heart-failure in Oxford Street. The deceased gentleman was author of a book "Electricity made Plain."

Mr. R. M. Reid.—The death occurred on February 20th, of Mr. Robert Moffat Reid of the firm of Reid & Co., electricians, of Ayr. He was 74 years of age.

Will.—Referring to the will of the late Dr. C. A. Mercier, of Bournemouth, *The Times* states that in drawing up his will Dr. Mercier believed that considerable sums might accrue to him or to his estate after his death from his share in the "Wolfryn process" for the electrification of seeds for wheat-growing. His estate is now valued for probate at £4,899.

NEW COMPANIES REGISTERED.

Luminor Signs (British), Ltd. (173,368).—Private company. Registered February 25th. Capital, £10,000 in £1 shares. To adopt an agreement with E. Bertron, and to carry on the business of advertising agents and contractors, manufacturers of displayed signs, letters or designs, or the exhibiting, lighting or movement thereof. The first directors are: A. J. Henderson, Henwick, Ray Park Avenue, Maidenhead; Lieut.-Com. H. H. Tatham, R.N. (retd.), 54, Beaufort Mansions, S.W. 3; D. A. Edwards, Northcote House, Minster Road, N.W. (director Kendal Mills & Co., Ltd.). Registered office: 128, Jermyn Street, S.W. 1.

Three Star Accumulators, Ltd. (173,287).—Private company. Registered February 22nd. Capital, £3,000 in 10s. shares. To carry on the business of mechanical and electrical engineers, manufacturers of batteries, cells, accumulators, electrical and magnetic machinery, &c. The subscribers (each with one share) are: L. J. Latey, 8, Serjeant's Inn, E.C. 4, solicitor; W. G. Saville, 8, Serjeant's Inn, E.C. 4, clerk. P. Abrahams signs as "director." Registered office: 54, Redcross Street, E.C. 2.

J. B. Midgley, Ltd. (173,285).—Private company. Registered February 22nd. Capital, £500 in £1 shares. To carry on the business of electricians, electrical and mechanical engineers, manufacturers and workers of and dealers in electricity, &c. The first directors are: J. B. Midgley, 205, Hampton Road, Twickenham, S.W.; J. J. Tanner, 205, Hampton Road, Twickenham, S.W.; F. Johnson, 207, Hampton Road, Twickenham, S.W.; P. E. Gallogher, 207, Hampton Road, Twickenham, S.W. Secretary: P. E. Gallogher. Registered office: 26, Caledonian Road, King's Cross, N. 1.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Wigan Electro-Metallurgical Works, Ltd.—Particulars of £1,500 debentures authorised February 1st, 1921; whole amount issued; charged on company's undertaking and property, including uncalled capital.

Glantawe Electric Supply Co., Ltd. (112,615).—Capital, £15,000 in £10 shares. Return dated September 23rd, 1920. All shares taken up and fully paid in cash. Morgages and charges: Nil.

CITY NOTES.

The Underground Electric Railways Co. of London Ltd.

In their report for 1920 the directors give the following particulars relating to the associated operating companies. The dividends, &c., of the various companies have already been announced.

	1920	+ or −
Total passengers carried	1,486,588,772	+110,243,599
Total car and omnibus miles ...	178,735,418	+ 19,208,525
Gross earnings of the Railway, Tramway, and Omnibus Companies associated with the undertaking	£ 14,844,707	+ £ 2,440,077
Expenses, including interest, rentals and other fixed charges and reserves for contingencies and renewals	14,131,370	+ 2,524,933
	713,337	− 84,856
Balances brought forward from last year's accounts	138,518	− 13,052
Balance, being amount available for Dividends and Further Reserves	£851,855	− 97,908

The report states that delivery of the 140 additional cars which were ordered last year by the Metropolitan District and the London Electric Railway Companies has been commenced, and the cars are being put into service. Seventy out of the 72 cars constituting the London Electric and London and North-Western Railway Companies' joint rolling stock for the service to Watford have also been delivered and are being put into service. The electrification of the Ealing and Shepherd's Bush line of the Great Western Railway was completed during the year, and the trains of the Central London Railway commenced running into Ealing Broadway on August 3rd, 1920. The Metropolitan Electric and London United Tramway Companies have reconstructed further portions of their permanent way, and the former company has established additional through running over the tramways of the London County Council to Liverpool Street and Bloomsbury.

The company's issue of 5 per cent. three year secured notes matured during the year. A new issue of £700,000 6 per cent. three year secured notes, was made on March 20th, 1920, and the maturing notes were paid off accordingly. Referring to the increased fares introduced during the year, the report says that the effects of the increases, and of the cancellation on the date on which they were put into operation of the financial arrangements which had existed between the Government and the Metropolitan District Railway Co. during the war, were felt only during the last three months of the year under review, whilst increased working expenses prevailed throughout the year. The directors of the operating companies report that further experience of the result of the new fares is necessary before it will be possible to say definitely whether they will be sufficient to provide for working expenses, efficiently maintaining and renewing the various undertakings, and a reasonable return on the capital of the companies, but that, so far, the results are up to their expectations. Some of the operating companies require additional capital for improvements and additions, and the improved financial position which it is hoped will result from the new fares should make it possible for them to raise the money required for these purposes when a favourable opportunity occurs. To ensure the better working of the undertakings, the directors of the operating companies have completed and brought into being a scheme of reorganisation of the administrative staff. Under this scheme Mr. H. E. Blain, C.B.E., and Mr. Frank Pick have been appointed assistant managing directors to the several operating companies, and Mr. Z. E. Knapp has been appointed director of construction to the four railway companies. These gentlemen have for a number of years been associated with the management of these undertakings. Various consequential changes have been effected, all of which will be to the advantage of the companies concerned, and should result in the more successful operation of the several undertakings.

North London Railway Co.

The Hon. A. H. Holland-Hibbert presided at the meeting of the North London Railway Co. on February 14th. In moving the adoption of the report and accounts, he said that the line had held its own, despite competition. They had carried 5,000,000 more passengers, and as a result of increased fares and more passengers they had taken £61,500 more money. That was most encouraging when they compared the position with the black years from 1902 to 1908, when they were faced with a daily falling off in traffic. In a great measure the change was due to the electrifying of the line, which provided a quicker and more attractive service. They were able to declare the same total dividend as last year, were putting £10,000 to the general reserve, bringing that up to £155,000, and were carrying forward £14,500, as compared with £13,000. With regard to the future, anyone who had been misguided enough to think that when Government control was over the path of the railways would be smooth had been rudely undeceived.—*Financial Times.*

Northampton Electric Light and Power Co., Ltd.

At the annual meeting, Mr. F. H. Thornton, who presided, said that the working of the new generating station in the first complete financial year had resulted in a saving of no less than 10,700 tons of coal, as compared with the old generating station. In view of the demand for electricity, particularly when they were able to extend to Wellingborough and Rushden, they had decided that it would be necessary to double the capacity of the Hardingstone generating station. The revenue from the sale of energy had increased by £22,171, partly due to a 16 per cent. increase in supplies and partly to the increase in tariff. Referring to the proposed extensions to Wellingborough and Rushden, Mr. Thornton said that in February last, at the suggestion of the Electricity Commissioners, they reopened the original application for powers to supply in Wellingborough and Rushden under the Electric Lighting Act, and they arranged for a meeting between the representatives of the company and those of the Northamptonshire County Council in London in May last, at which both sides were heard, but owing to the continued and persistent opposition of the County Council, when the Commissioners gave their decision later in the year, it was to the effect that it would be necessary for the company to make a fresh application under the new Electricity (Supply) Act, 1919, which gave the Commissioners much greater power to deal with cases of this kind. The application was now proceeding, but it was a much more lengthy process than under the 1909 Act.

Charing Cross, West End and City Electricity Supply Co., Ltd.

The report for 1920 shows that the gross earnings of the West End undertakings were £311,045, against £265,856 in 1919, and the expenses, excluding depreciation, were £208,214, against £167,242. The net earnings were £102,830, against £98,614. Including £8,002 brought forward and interest accrued for 1920 £6,387, the total available is £117,220. Debenture interest requires £17,829; to depreciation £22,000; preference dividend £18,000; 8 per cent. on the ordinary shares £32,000; to general reserve (income) account £15,000; carried forward £12,391. Connections to West End mains equivalent of 823,251 (30 watt) lamps (lighting 479,612, heating 94,786, motive power 248,853 (10,007 h.p.).

The gross earnings of the City undertaking were £418,746, against £331,323 for 1919; expenses £355,062, against £273,722; net earnings £63,685, against £57,601. Including £7,218 brought forward there is £70,902 available. Interest on debenture stock, 6½ per cent. five-year secured notes, loans, and advances £38,411; preference dividend £18,000; £10,000 to general reserve; £4,491 carried forward. Connections to City mains equivalent of 913,259 (30 watt) lamps (lighting 347,156, heating 151,003; motive power 413,100 (16,693 h.p.)).

The directors in the early part of the year 1920 decided to carry out certain alterations and improvements at the Bow Station, and for this purpose issued £250,000—6½ per cent. notes, repayable in five years, upon reasonably satisfactory terms. These notes were secured by the issue to the trustees for the note-holders of debenture stocks of the two undertakings. The issue of these debenture stocks has made it advisable to ask the company for further borrowing powers. The new Electricity (Supply) (No. 2) Bill appears to need amend-

ment in certain particulars in the interests of existing undertakers.

The Electricity Commissioners, acting under the Electricity (Supply) Act, 1919, have provisionally determined a London District, and have asked for schemes for the establishment of an Electricity Authority for the district.

The leading London companies, acting in association with the London County Council and the Conference of Local Authorities, have in preparation a technical scheme which they hope to submit for consideration by the Commissioners.

The extremely important administrative and financial conditions which should govern the creation and powers of a Joint Electricity Authority are at present having the careful consideration of the companies in view especially of the necessity of safeguarding the interests of their shareholders.

It is hoped that the scheme ultimately put forward will be such as to secure the best use of existing resources and experience, with the object of producing and selling electricity as widely and as cheaply as possible.

West End: Units generated, 1,469,611; bought, 18,235,363. Total sold, 14,563,403.

City: Units generated, 46,501,930; sold, 38,357,680.

Meeting: March 10th.

Liverpool Overhead Railway Co.

At the annual meeting, held on February 22nd, Mr. H. C. Woodward, who presided, said that Government control of the railway, unless Parliament decided otherwise, would expire on August 15th next. The passengers carried during 1920 totalled 21,020,839, a decrease of 1,419,264. Part of the decrease in traffic was doubtless due to the increase in fares, and it was also due to the depression in trade and to the shipwrights' strike, which caused many ships to be diverted to other ports for repairs and reconditioning. The depression still existed, and with much shipping unemployed, the traffic on the overhead railway still declined. The renewal funds now amounted to £66,597, against £66,236. The reason for so small a net increase was that 11,145 yards of new rails had been laid during the past year, and the cost of the new rails, as in previous years, had been charged to that fund. The necessity for a slight reduction in the dividend was brought about by the high cost of rails and other materials, and it was imperative in the future interests of the company to keep up the renewal fund. The accounts showed an increase in the expenditure on the railway and tramway of £56,880, which was due to the much higher cost of coal and stores, and the enhanced wages of the employés. So long as Government control existed they were guaranteed the same net income as in 1913, and therefore felt entitled to distribute the same dividends as in that year. But they were given to understand that from August 15th next the Government proposed to relinquish their grasp, or at all events to effect some new arrangements as to grouping adjacent lines, although they had no details nor ideas as to how it might affect their company. It was useless to attempt to prophesy, but he thought it right to point out to the shareholders that such a change amounted to a crisis in their affairs, and that unless they could make a very satisfactory settlement with the Government or some other powerful body, they could not guarantee future dividends even on the recent modest scale. They had all noticed the keen criticism of the excess profits duty, yet there was at the same time in some newspapers a suggestion that the railways made too good a bargain with the Government on the outbreak of the war; these critics appeared to ignore the fact that, instead of taking 40, 60, or 80 per cent. of the excess receipts of railways during the war, and subsequently, the Government took the whole of the excess, and that, while they invited the railways to increase their fares, they, at the same time, increased their wages bills fourfold. The extra receipts during the war would have created reserves to meet betterments, then impossible to effect, owing to the scarcity of labour and material, but now badly needed by every railway in the Kingdom. At the same time, he did not want to appear too pessimistic as regarded their own railway. It was now such an integral and necessary part of the dock traffic arrangements that he felt some plans must be devised to ensure its continuance, and, he hoped, its ultimate prosperity.

South Metropolitan Electric Light and Power Co., Ltd.

The ordinary general meeting of the company was held on February 23rd. Mr. Henry St. John Winkworth (the chairman) said the accounts for the past year showed that substantial progress had been made. Not only had the growth of the business been well maintained, but the abnormal cost of fuel and the high rate of wages ruling had been met, with a balance on the right side. The company had difficulty at the power house during the greater part of the year, due to repair work being delayed by labour troubles, which increased the working costs. The result, however, was satisfactory. The total horse power connected at the end of the year was 30,726, as compared with 28,596 at the end of the previous year. Five hundred and thirty-nine new services, representing 56,553 35-watt lamps, were connected during the year, compared with 522 services and 59,410 lamps last year. The total number of consumers connected to the company's system at December 31st was 8,091. The number of units sold was 17,643,122, as compared with 15,642,716 in the previous year, representing an increase of just over two millions, and the average price obtained from all classes of supply increased from 2.39d. to 2.55d. per unit. Only a small addition in the price was charged to the consumer, the higher cost of production being substantially covered by the increased output and a better load factor. The business of the West Kent Co. showed a satisfactory improvement, and a dividend of 10 per cent. on the ordinary shares had been declared. A sum of £8,000 had been placed to the reserve account and £1,742 carried forward to this year. The West Kent Co. made application to the Board of Trade for its approval of the freehold site on the Lower Thames acquired for the erection of a large up-to-date power house, as referred to at the meeting in 1918. The statutory requirements were complied with, and the one and only objector satisfied. The Electricity Commissioners, to whom the application was subsequently referred, however, decided to postpone consideration until after the scheme or schemes asked for had been received. This delay was most regrettable, as it had prevented the company from concluding negotiations for important business which could only be dealt with on comprehensive lines. It was difficult to forecast the prospects of the business for the current year; much depended upon labour settling down and manufacturers finding a market for their productions. While it was probable there would be trade depression, there was reason to hope that this would be only of short duration, and that the works and factories within the company's area would soon resume their activities. A number of substantial new connections had been made during the past year, and it was anticipated that the receipts from these would enable the company to continue to make further progress during the current year.—*Financial Times.*

St. James' & Pall Mall Electric Light Co., Ltd.

The ordinary general meeting of shareholders was held on February 22nd. Mr. Walter Leaf (Chairman), who presided, said that the company's statistics showed a satisfactory growth alike in connections, which had increased by 1,002 kW, or over 5 per cent., and output, which had grown from a little over 12 million units to 13¼ millions, or nearly 11 per cent. The company had found itself able to allow an all-round discount of 5 per cent. on accounts for the first three quarters of 1920 to customers paying standard rates, which was equivalent to returning to them an amount considerably in excess of the extra dividend. Unfortunately the situation at the present moment was not so clear as could be wished, and they had found it necessary to withdraw the discount, at least for a time; they had also taken the opportunity to consolidate in a fresh tariff the various additions that had been made. The increase in charge was hardly more than nominal, and the highest price charged was still below the maximum allowed by their order. There was a large increase in the sum advanced to the Central Company. Last year it stood at £55,000; this year it was no less than £112,000. Regarding the large extensions to the Grove Road Station, there had been further serious delay in the completion of the first of the two 10,000-kW sets on order, but it was now in course of erection, and would be completed within the next few months. In consequence of this delay the available plant at Grove Road, together with the steam plant in the stations of the St. James' and Westminster Companies, was only just sufficient to meet the demand, which, however, throughout the winter was carried on without disturbance or breakdown. Good progress had been made in the manufacture of the second 10,000-kW set and the additional boilers, and this plant should be completed in time for next winter's load. The reorganisation of Carnaby Street Station had been proceeded with, but had been delayed by the non-completion of the new plant at Grove Road. Motor converting plant of the latest type, of 1,000-kW capacity, had, however, already been installed, and the remainder of the necessary machinery had been manufactured and would be brought into commission during the coming summer. There was considerable difficulty in the early part of the year in securing adequate supplies of coal, and reserve stock fell to a very low point. Arrangements were made accordingly to control a certain number of wagons for the last nine months of the year, which ensured full supplies of coal of the right quality, so that stocks were built up to a satisfactory figure and covered the shortage, due to the miners' strike, in October last, without difficulty. The policy of the Central Company had been to keep its station absolutely up to date, and for this purpose it had not hesitated to authorise these extensions alike in buildings and plant, involving from first to last a capital outlay of some £800,000. The work had been carried out with the express sanction of the Electricity Commissioners, and, though this sanction did not import any legal guarantee, it seemed virtually to indicate the intention that if, as seemed probable, the generation of electricity in London was taken over as a public service under a Joint Electricity Authority, the works which had been thus sanctioned would be fully utilised in the future supply of London.

Under these circumstances, the Board of the Central Company had no anxiety as to obtaining the full return of the capital so laid out. But the financing of the expenditure during the period of transition was a difficult problem. The board of the Central Company had decided, with the co-operation of the boards of the parent companies, to make an issue of short-term notes, which would be placed on the market as soon as the moment seemed favourable. The notes would be secured the joint and several guarantees of the parent companies, as well as by a charge on the Grove Road properties subject to the existing mortgage, and would form a security of the highest class. The company had not the least doubt that, in a comparatively short time, it would be able to recoup itself by the increased efficiency of the new plant.—*The Times.*

London Electric Supply Corporation, Ltd.

The ordinary general meeting of shareholders was held on February 21st. Mr. Robert H. Benson (chairman), in the course of his speech, said that the company was on the road to surmounting the losses of the war, and that there was a fair chance of resuming from the point where they left off at the end of 1914, subject only to political conditions, namely, a final settlement by Parliament of the future of the industry and the restoration of its credit on the basis contemplated in Clauses 1 and 13 of the latest Electricity Supply (No. 2) Bill; in other words, that producers of electrical power be authorised to borrow money and get such return for their product as would make them certain of being able to repay the money borrowed. In these clauses might be discerned the first sign of recognition of the part of the legislative mind of the rock upon which the electrical industry had come near to splitting, namely, inability to borrow money for capital purposes. An engineering scheme was being prepared by four engineers (of whom the company's managing director and chief engineer was one), representing the supply companies, the local authorities, and the London County Council. It, therefore, seemed probable that, as all three bodies were working together, a harmonious scheme, so far as engineering was concerned, would be put before the Commissioners, and this was a most important point. Besides the engineering scheme for the whole of the area of Greater London, the difficult question of administration by a Joint Electricity Authority was having the careful consideration of the directors, along with those of other supply companies.—*The Times.*

Metropolitan Electric Supply Co., Ltd.

Capital expenditure increased by £72,409 during 1920. Gross revenue was £516,594, an increase of £108,535. Working expenses £318,638, an increase of £76,015. £90,000 has been put to depreciation and reserve account, which now stands at £615,000. Amount carried to net revenue account £107,956, plus amount brought forward and interest on investments, making £130,858. After paying debenture interest, and preference dividend, a total of 7 per cent. is paid on the ordinary shares, leaving £4,514 to be carried forward. New connections 3,374 kW, making 48,800 kW. Owing to the continued increase in demand, particularly in the western area of supply, contracts have been placed for an increased plant capacity at Willesden of 20,000 kW, and for trunk mains to link up with the generating station at Uxbridge, where further plant has already been installed. The Electricity Commissioners have provisionally determined a London District, and have asked for schemes for the establishment of an Electricity Authority for the district. The leading London companies, acting in association with the L.C.C. and the Conference of Local Authorities, have in preparation a technical scheme which they hope to submit for consideration by the Commissioners. The extremely important administrative and financial conditions which should govern the creation and powers of a Joint Electricity Authority are at present having the careful consideration of the companies, in view, especially, of the necessity of safeguarding the interests of their shareholders. It is hoped that the scheme ultimately put forward will be such as to secure the best use of existing resources and experience, with the object of producing and selling electricity as widely and as cheaply as possible. The death has occurred of Mr. J. Carr Saunders, who was a director for 21 years. It is not proposed to fill this vacancy at present.

Meeting: March 8th.

France.—The following companies have increased their capital: Société Electrique de Montjoie, from 310,000 to 500,000 fr.; the Station Electrique de Millery, from 2,500,000 to 5,000,000 fr.; the Electro-Entreprise, to 5,000,000 fr.; and the Société d'Etudes Techniques et d'Entreprises Industrielles, from 500,000 to 1,000,000 fr.

Bruce Peebles & Co., Ltd.—At an extraordinary meeting to-day, it is to be proposed to alter the articles to allow the new shares to be issued carrying dividend as from January 1st last, so that they may be in precisely the same position as the existing ordinary shares.

Brompton & Kensington Electricity Supply Co., Ltd.—Final dividend on the ordinary shares at the rate of 15 per cent. per annum, making 12 per cent. for the year, less tax. Forward, £1,639.

Canadian General Electric Co.—Dividends at the rate of 7 per cent. per annum on the preference stock for the half-year ending at March, and a quarterly dividend of 2 per cent. on the common stock.

Lancashire United Tramways Co.—The report shows that the receipts increased by £50,838 and the expenditure by £60,682 during 1920. Profit £50,852. After deducting interest on prior lien debenture stock and expenses, the full interest of 5 per cent., less tax, is to be paid on the second mortgage debenture stock for 1920, and £2,416 remains to be carried to depreciation.

Oxford Electric Co., Ltd.—Dividend at the rate of 5 per cent. per annum on the ordinary share capital.

The A.E.G.—The board of the Allgemeine Elektrizitäts Gesellschaft has decided, subject to the approval of a shareholders' meeting to be held on March 15th, to double the company's share capital by raising it from 300 million to 600 million marks. This is to be effected by the issue of 50 million marks in ordinary shares and 250 million marks in preference shares. Out of the 50 millions in ordinary shares 30 millions will be devoted to carrying through the fusion of interests with the Linke-Hoffmann-Werke Aktiengesellschaft, and the directors state that the sum represented by the preference shares is required for the purpose of covering necessities arising out of the Linke-Hoffmann transaction, and of increasing the working capital, especially with a view to improving the company's foreign business. The new preference shares will bear a 5 per cent. cumulative dividend, together with a supplementary dividend of ⅔ per cent. for every 1 per cent. dividend over 10 per cent. paid on the ordinary shares. They will be redeemable by the company at any time after 1924 at the rate of 115 per cent.—*Reuter's Trade Service* (Berlin, February 22nd).

Companies to be Struck off the Register.—The following are to be struck off the register within three months unless cause is shown to the contrary:—

Bourne End Electric Installation Co., Ltd.
Cold Light (Dussaud Processes), Ltd.
Indian Railless Traction, Ltd.
International Electric Railways & Water Power Syndicate, Ltd.
International Rotary Motors, Ltd.
Northern Power Syndicate.
Premier Electric & Hardware Co., Ltd.

The Swedish Allmanna Co.—The net profits of the Allmänna Svenska Elektriska A.B. for 1920 amount to 4,000,000 kr., and the surplus available for disposal, including the balance forward, reaches 4,837,000 kr., permitting of the payment of a dividend at the rate of 6 per cent. In 1919, when the net profits were 8,029,000 kr. and the total surplus 8,313,000 kr., the directors recommended a dividend at the rate of 10 per cent., but at the general meeting the rate was increased to 12 per cent. by the appropriation of 1,500,000 kr. from the profits equalisation fund.

Newcastle and District Electric Lighting Co., Ltd.—Net profit for 1920, after charging interest on debentures and loans, &c., allowing £16,000 for depreciation, putting £16,000 to general reserve, is £11,104, plus £13,263 brought forward. A dividend at the rate of 5 per cent. (less income tax) requires £10,412, and £13,955 is to be carried forward. Second mortgage debentures amounting to £5,160 redeemed during the year. Many new consumers have been connected and considerable extensions to existing installations made. £23,065 was expended on capital account during the year.

Bournemouth & Poole Electricity Supply Co., Ltd.—Capital expended during 1920 £31,514. Total amount available, including £4,628 brought forward, £47,104. Debenture and loan interest £9,659; other interest £2,396; written off preliminary expenses £500; to reserve for depreciation £12,000. Preference dividends 4½ per cent. and 6 per cent.; ordinary dividend 6 per cent. for the year, less tax. £6,536 carried forward. Lord Erskine has been appointed a director in place of the late Mr. F. E. Savory. Total applications during 1920 16,233 kW, an increase of 1,942 kW. Units sold 6,198,302.

River Plate Electricity Co.—According to the "Financial Times," the 122,440 ordinary shares of £1 each which were issued to the shareholders in May last have now been converted into ordinary stock, ranking for dividend as from January 1st, 1920, and in all other respects *pari passu* with the existing ordinary stock. The greater part of the company's claim against the German Transoceanic Electric Co. (of Berlin) for arrears of interest and amortisation on the 5 per cent. obligations of that company was received through the Clearing House for Enemy Debts on February 16th.

Rushden & District Supply Co., Ltd.—At the annual meeting, Mr. Thornton said it was hoped shortly to obtain a bulk supply from the Northampton Co., and it would undoubtedly be the most satisfactory way of supplying the demands in the Rushden area for power and light. To generate it themselves would only involve charging a higher rate to the public. The company was anxious to carry the supply to Irthlingborough at the earliest possible moment.

Mackay Companies.—Income from investments for year to February 1st, 1921, $4,868,988; dividends absorbed, $4,230,336; operating expense, including Federal income-tax, transfer agents, registrars, auditors' and trustees' compensation, office rent, salaries, stationery, engraving of certificates, &c., $535,400; carrying forward $103,251.—*Financial Times.*

Stock Exchange Notices.—The Committee has ordered the undermentioned to be officially quoted:—

American Telephone & Telegraph Co.—$61,248,500 capital stock.
River Plate Electricity Co.—£122,440 ordinary stock.

Shanghai Electric Construction Co.—The directors propose to capitalise £80,000 of the reserve account, and to distribute that sum among the shareholders in the form of £10 shares in proportion to their holdings or one share for each four held. The capital is now £320,000, in £10 shares, and the proposed issue will bring it up to £400,000.—*Financial Times.*

Northallerton Electric Light & Power Co., Ltd.—At the annual meeting on February 23rd, the report adopted showed a net profit of £714, against £460 in 1919. Dividend 5 per cent. on the preference shares, and 1s. per ordinary share, both less tax.

National Electric Supply Co., Ltd.—Dividend on the ordinary shares 6s. 6d., making 9s. per share for the year. £5,000 to depreciation reserve, £3,000 to reserve, and £1,367 carried forward.

STOCKS AND SHARES.

TUESDAY EVENING.

ONE week is very like another in the Stock Exchange these times. Excitement has died down. The speculative spirit is profoundly dormant, if not entirely dead. There is still a good deal of money available; money which goes principally into the War Loan and other gilt-edged securities when it comes to the Stock Exchange at all. Nevertheless, industrials of the better sort command a certain amount of interest. Our lists during the past fortnight have shown a revival of demand for electricity supply shares, due to the manner in which dividends are being increased, and further improvements occur in the current list. Jobbers in the market find that brokers are beginning to ask what electricity supply shares are available. The report of the Metropolitan Electric Company is well worth reading, if only from its allusions to the matter of the Electricity Authority which is to be set up in London. As against the improvements in supply shares, further falls have occurred in certain of the manufacturing companies' issues. Optimists argue that E.P.D., now that there is the certainty of the tax coming off before long, constitutes a valuable reserve of the "secret" order, but this is not much immediate consolation to people who want dividends and who see the prospect of such payments being removed out of their reach by crushing taxation, coupled with the slump in trade.

The principal feature in the financial world is the way in which Home Railway stocks have been slumping by reason of the fears that, upon the companies being handed back to their owners next August, the former will not be able to maintain their existing rate of dividends. It was hinted plainly enough at some of the recent meetings that the railways might not even be able to meet their fixed charges. There is an enormous body of railway proprietary throughout the country, composed of classes of people mainly inarticulate. Two associations exist for the protection of railway stockholders' interests, and one of them, the Scottish group, develops a good deal of energy. But the English association cannot be described as a power in the land, although at the present time efforts are being made, partly through its agency, to awaken the country to a sense of the unfair treatment which apparently railway stockholders are to suffer. The Undergrounds are not nearly so much affected as the steam lines, but their prior-charge stocks have fallen considerably with the rest, and it is interesting to observe what yield is offered by the leading stocks at to-day's prices:—

Debenture Stocks.	Price.	Yield. £ s. d.
Cent. Lon. 4 %	57½	6 19 2
City and S.L. 4 %	53½	7 12 5
Met. 3½ %	59½	6 10 10
District 6 %	81½	7 7 3
do. 4 % p.l.	57½	6 19 2
do. 4 %	53½	7 9 7

Preference Stocks.	Price.	Yield. £ s. d.
Cent. Lon. 4½ %	18½	7 13 10
City & S.L. 5 % 1891	54½	9 8 6
Lon. Elec. 4 %	47	8 19 2
Met. 8 %	41½	8 8 8
District 4½ %	42	9 7 6

The District preference depends for its dividends upon the income each half-year. Amongst Underground Electric Railway's stocks, the 4½ per cent. bonds of 1933 stand at 90, paying 5 per cent. on the money, while the 6 per cent. first cumulative income debenture stock is quoted 75½. All these debenture and preference issues were recently ex dividend.

The list of home electricity supply shares makes pleasant reading this week. Pleasanter, indeed, than has been the case for a long time past. The market is one of the very few in the Stock Exchange where firmness is exhibited. Advances have occurred in City of London, County ordinary and preference, Kensingtons, Metropolitans and South Metropolitan preference, while several prices are ex dividend without showing any quotable alterations on account of the deductions.

We understand that in certain cases some of the companies are about to arm themselves with power to issue more capital, and it would not be surprising if, within the space of the next few weeks, some of the important concerns appeared in the market asking for more money. In spite of the badness of the times, newcomers make their appeals with persistency, and this week the Armstrong-Whitworth company, amongst others, is about to offer fresh shares. These will be 3½ million 9 per cent. second preference shares at the par price of 20s. Armament shares, incidentally, are heavy, owing to the unexpected jump which has just been announced in the price of coal. Although this may not affect the price of fuel for manufacturing purposes, the step has certainly aroused fresh uneasiness in the minds of shareholders in such concerns.

Manufacturing descriptions are mostly dull. Babcock & Wilcox gave way to 2½. Electric Constructions are down to 15s. 9d., Henley's eased off to 1⅛. Nor are other prices so firm as they look in every case. There is no little apprehension felt with regard to maintenance of dividends even by the first-class companies. Brush ordinary shares have fallen to 12s. 6d., Metropolitan-Vickers ordinary gave way to 17s., and the 4 per cent. debentures to 50½.

Marconi's flattened out to 1½, a fall of 5s. on the week. Marconi Marines at 1 1/16 and Marconi preference at 33s. 9d. are both easier. Otherwise the cable group is firm, with rises of 5s. each in Eastern Extensions and Globe ordinary, taking the prices to 15½. Eastern ordinary hardened to 161½, and in Anglo-Americans there is no change.

The foreign group is inclined to give way, Brazil Tractions going back to 37½ and Mexico Tramway 5 per cent. bonds to 39, the latter being 1½ down. British Columbia stocks are left as they were. Rubber shares are depressed, in consequence of the raw material showing no indication of improvement. Stock Exchange markets lack encouragement from buyers. Nothing can better illustrate the present state of affairs than mention of the fact that this time a year ago a nomination to Stock Exchange membership cost £650, whereas to-day it is possible to buy a nomination for £50, or less.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1919.	Dividend 1920.	Price March 1, 1921.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	12	13	6½	+ ½	£9 16 0
Charing Cross Ordinary	7	8	3½	— ⅛	10 6 6
do. do. do. 4½ Pref.	4½	4½	2⅝	—	8 8 8
Chelsea	4	6	3½	—	9 10 6
City of London	13	14	25/-	+9d.	11 4 0
do. do. 6 per cent. Pref.	6	6	17/6	—	6 17 1
County of London	8	8	7⅝	+ ⅛	10 9 10
do. do. 6 per cent. Pref.	6	6	8½	+ ⅛	7 5 5
Kensington Ordinary	7	9	4	+ ⅛	11 5 0
London Electric	2½	3½	1xd	+ ⅛	10 0 0
do. do. 6 per cent. Pref.	6	6	2½xd	+ ⅛	10 18 2
Metropolitan	6	7	1½	+ ⅛	10 15 4
do. 4½ per cent. Pref.	4½	4½	2⅛	—	8 15 6
St. James' and Pall Mall	12	12	6xd	—	10 0 0
South London	6	—	3⅝	—	9 2 10
South Metropolitan Pref.	7	7	18/9	+ 2/-	6 17 10
Westminster Ordinary	10	10	5xd	—	10 0 0
Telegraphs and Telephones.	1918	1919			
Anglo-Am. Tel. Pref.	6	6	83½	—	7 9 3
do. Def.	33/6	1½	16½	—	9 6 6
Chile Telephone	6	6	3½	—	5 6 6
Cuba Sub. Ord.	7	7	6½	—	10 15 4
Eastern Extension	10	10	17½	+ ½	6 6 0
Eastern Tel. Ord.	8	10	161½	+1	6 3 10
Globe Tel. and T. Ord.	8	10	15⅝	+ ½	6 6 0
do. do. Pref.	6	6	9	—	6 13 4
Great Northern Tel.	23	23	21½	—	10 2 4
Indo-European	13	10	80	—	6 6 8
Marconi	25	25	1½	— ½	—
Oriental Telephone Ord.	10	12	2¼	—	*5 9 7
United R. Plate Tel.	8	8	6½	—	*6 8 0
West India and Panama	1/8	Nil	¼	—	Nil
Western Telegraph	8	10	16⅛	—	*6 5 0
Home Rails.	1919	1920			
Central London Ord. Assented	4	4	48½xd	+1½	9 4 0
Metropolitan	1½	1½	10xd	+ ½	7 10 0
do. District	Nil	Nil	12½	—1½	Nil
Underground Electric Ordinary	Nil	Nil	1⅜	— ⅛	Nil
do. do. "A"	Nil	Nil	5/8	—	Nil
do. do. Income	4	2	67½xd	—	2 19 8
Foreign Trams, &c.	1918	1919			
Anglo-Arg. Trams, First Pref.	Nil	5½	2⅜	—	10 9 6
do. do. 2nd Pref.	Nil	Nil	3⅜	—	Nil
do. do. 5 % Deb.	5	5	80½	—	6 4 0
Brazil Tractions	Nil	Nil	37½	— ½	Nil
British Columbia Elec. Ry. Pfd.	5	5	50	—	8 18 6
do. do. Preferred	2½	5	53½	—	*9 16 0
do. do. Deferred	Nil	8	42½	—	*12 17
do. do. Deb.	4½	4½	67½	—	7 .0
Mexico Trams 5 per cent. Bonds	Nil	Nil	39	- 1½	Nil
do. 6 per cent. Bonds	Nil	Nil	94½	—	Nil
Mexican Light Common	Nil	Nil	19⅜	—	Nil
do. Pref.	Nil	Nil	18	—	Nil
do. 1st Bonds	Nil	Nil	63½	—	Nil
Manufacturing Companies.					
Babcock & Wilcox	15	15	9½	— ½	7 1 2
British Aluminium Ord.	10	10	17/-	—	11 15 4
British Insulated Ord.	12½	15	1⅜	—	9 6 10
Callenders	25	15	1⅜	—	10 19 2
,, 6½ Pref.	6½	6½	17/6	—	7 8 7
Castner Kellner	20	17	2½	—	7 12 8
Crompton Ord.	10	10	18/9	—	14 11 0
Edison-Swan	10	10	10/-	—	—
do. do. 5 per cent. Deb.	5	5	70	—	7 2 10
Electric Construction	10	10	15/9	- 6d.	12 14 0
English Electric	—	8	12/-	—	10 19 2
Do. Pref.	—	6	13/6	- 6d.	8 17 10
Gen. Elec. Pref.	6½	6½	18/6	—	7 2 5
do. Ord.	10	10	1⅝	—	*8 8 5
Henley	25	15	1⅛	— ⅛	10 18 2
do. 4½ Pref.	4½	4½	9½xd	—	6 18 6
India-Rubber	10	10	¼	—	—
Met.-Vickers Pref.	—	8	14½	—	8 16 1
Siemens Ord.	10	10	21½	—	*10 6 1
Telegraph Con.	20	20	21½	—	*5 11 3

* Dividends paid free of Income Tax.

THE BRITISH INDUSTRIES FAIR.

(*Concluded from page 232.*)

BIRMINGHAM SECTION.

It is difficult at this stage of the Fair to express an opinion as to its success from the exhibitors' point of view. As an exhibition the Birmingham Section leaves very little to be desired; the wares are tastefully displayed, the method of numbering the stands ensures that none is overlooked, and as far as possible the various classes of goods have been grouped to facilitate the buyer's work. The first two days of the Fair witnessed a great influx of sightseers, the buyers apparently having decided to visit the London Section first. Later, however, business commenced to improve, and by the end of the first week affairs assumed a more satisfactory appearance.

On Wednesday, February 23rd, Mr. F. G. Kellaway, M.P., paid a visit to this section, and is reported to have said that in London they had no idea of the representative character of the Birmingham Section of the Fair. This seems to bear out the statement of the publicity manager that an impression has gained ground that the London Section is the whole of the Fair, whereas the truth is that the *staple* industries of the country are displayed at Birmingham. Mr. Kellaway was impressed particularly with the excellent quality of the goods displayed, and also with the general air of optimism which seemed to prevail.

Sir James Allen, High Commissioner for New Zealand, visited the Fair on Thursday, February 24th, and stated that he intended to send a report to the Antipodes upon what he had seen. Among the merchants of New Zealand it was taken for granted that if quality was required the Mother Country was to be relied upon, and the exhibition proved to him (Sir James) that they were not in error.

A description of some of the exhibits follows:—

The General Electric Co., Ltd., have on their stand a representative show of their lighting fittings and accessories, domestic appliances, telephones, bells, &c. A number of motor-starting panels and drum controllers also appear. Among a series of commercial type ironclad gear is a 400-A, 600-V, double-pole switch and fuse set of very robust proportions. A range of "Witton Kramer" portable drills and grinders is shown, as well as a "C.M.I." quick-break magneto which gives a strong spark at any engine speed. The recently-introduced "Klersite" system for lighting commercial motors is on view. This consists of a series-wound dynamo fitted with a special patent pulley, which, through the action of a slipping clutch, maintains the dynamo speed constant, irrespective of the speed of the engine. The dynamo is running at all times when the engine is working, but if the

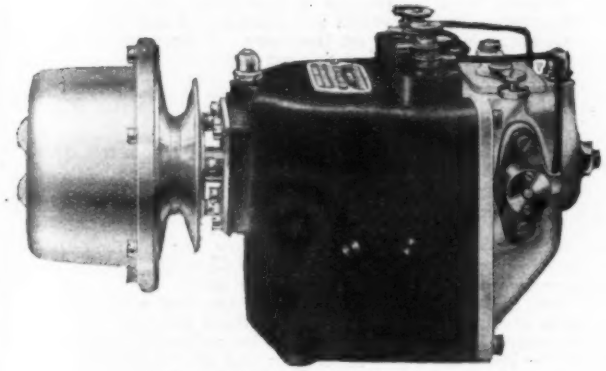


Fig. 1.—The "Klersite" Magneto.

lamps are switched off it is not excited, and so there is no electrical loss. The full pressure of 6 volts is obtained when the engine is running at 350 r.p.m. As the engine speed increases the clutch allows a certain amount of slip, keeping the dynamo speed constant. This fact is demonstrated on the stand by a "Klersite" magneto driven by a motor and connected to a speedometer and voltmeter. It is shown that the voltage is maintained at its proper level when the motor is running as fast as 1,150 r.p.m. The whole mechanism runs in oil. The magneto is illustrated in fig. 1. Photographs of installations carried out by the G.E. Co. form another feature of this exhibit.

Messrs. J. H. Tucker & Co., Ltd., are showing a very comprehensive range of their products. A complete accumulator switchboard is shown; this is suitable for employment with batteries and lighting sets for country houses, &c. Switches and fuses of various designs with capacities ranging from 15 to 1,000 amps. are also exhibited. These include single, double, and triple-pole, single-throw and change-over types, tandem and parallel-coupled, shunt regulating switches, voltmeter switches, battery regulating switches, automatic battery switches, &c. Fuse and distributing boards for lighting and power installations in teak and iron cases are another feature of the exhibit; the wood cases are made in the firm's own cabinet shops. Among the ironclad switch and fuse gear appears the "Tucker" patent quick "make" and "break" switch in two sizes, 25 and 50A. The design of the case of this switch permits of its being used with either a large central tapped hole at each end for the cables or two smaller holes. This is effected by means of interchangeable adaptors, which can also be provided with recessed bodies and wood bushed holes and with watertight glands. In addition to these switches there is a number of ironclad single and double-pole and multi-way fuses varying in capacity from 15 to 100 A, for voltages up to 500. All types of tumbler switches are shown, including double-pole, ceiling and watertight switches, fitted with plain or ornamental covers, china and locked covers. Another feature is a flat switch of ordinary appearance, in which a quick "make" and "break" action is obtained. Included in the lighting and power accessories section the firm shows samples of lampholders, counterweights, ceiling roses, wall sockets, porcelain connectors, cut-outs, adaptors, bell pushes, &c. One or two samples are shown of a new type of tumbler switch and plug combination shortly to be placed upon the market. If the switch is in the "on" position, the plug cannot be driven home, while if once fixed the removal of the plug brings the switch to the "off" position. A great deal of artistic metal work in the form of wall plates and switch covers is also exhibited. Photographs of the works appear on the stand as well as views of special orders carried out by the firm.

Fuller's United Electric Works, Ltd., are exhibiting representative selections from their products, including plate and block type accumulators suitable for electric lighting installations and similar purposes. The plate type cells are constructed with hanging type semi-planté plates consisting of pure lead grids pasted with specially hardened active material in glass containers. The negative plates are of the lattice type, pasted under pressure, a method which ensures high and constant capacity. The block type cell is immune from the inherent weaknesses of the plate type, and is fitted with non-corrosive terminals and insulators. A complete electric miner's lamp equipment is exhibited. This consists of a charging rack and lampstand, each accommodating 160 lamps, an opening magnet and a pedal switch. The Fuller miner's lamp gives a light of high candle-power, weighs only 5 lb. 2 oz., and a charge lasts for at least 20 hours. The lamp is switched on and off by turning the top; it can be supplied with either magnetic or lead lock. Other exhibits are dry and inert cells, carbons for arc lamps, ebonite rods, sheets, tubes and mouldings, and rubber and bitumen insulated cables.

Messrs. W. Canning & Co., Ltd., have a comprehensive range of machines, plant and material for electro-plating, polishing, bronzing, lacquering and enamelling. Among the exhibits are low-voltage dynamos and motor generators, plating vats and barrels, and metal salts. Belt-driven polishing lathes and polishing motors, grinding machines, lapping lathes, &c., are shown.

Messrs. Donovan & Co. display a large selection of their well-known "Safuse" and "Donlok" gear, comprising distribution boards and switchgear for lighting and power purposes. The contacts of the "Safuse" unit are protected by an insulating shield, the blades passing through a narrow slot. This renders it impossible to touch the "live" parts accidentally. The fuses are "staggered" to permit of easy wiring, and ample space is allowed for wires at the back of the box. Factory and domestic electrical apparatus is also on view, as well as lamps, bells, and other accessories.

Messrs. Siemens Bros. & Co., Ltd., have as their main attraction a 30-line "Autophone" board, by means of which various stands are kept in communication with one another. The "Stannos" wiring system is shown, as well as a number of cable sections of the firm's manufacture. Ebonite rods and moulded parts for magnetos, telephones, and other electrical apparatus form another feature of the stand. Part of the stand is devoted to Siemens's signalling apparatus for use in mines. This equipment provides for signals, which are sent from the pit bottom, being received on bells both at the pit top and in the engine room. In addition, the signals are indicated visually on a dial indicator in the engine room. Provision is made also for signalling from the pit bank to the pit bottom by means of a push switch and a bell. Signals sent from either

the pit bank or the bottom are indicated on a dial in the engine room. The apparatus may be adapted to more complicated situations, and the dial indicators may be fitted to existing bell circuits. Messrs. Siemens are also showing samples of their dry and inert cells and a dry battery cycle-lighting set.

Berry's Electric, Ltd., have, in addition to several "Magicoal" fires, a very good display of switchgear, both of the open and flame-proof ironclad types. An "Ironsafe" switchboard is displayed prominently. The example shown is a d.c., 3-wire, board, with an ample bus-bar chamber, in which everything is accessible from the front. This type of gear is easily extended and very safe, the bus-bar chamber being locked by a bar and padlock device. The "Adanac" switches shown, which are simple but strong in construction, were manufactured for the Canadian market, and were used for two years prior to their becoming known in this country, the whole output being absorbed by the Dominion. The "Firadanac" is an adaptation of this type constructed entirely of iron, copper, and mica; it is flame- and explosion-proof. One or two examples are being shown of a new "Midget" d.p. switch or switch-fuse, which is a triumph of strong construction at a low price. Among the smaller exhibits is the "Asku" shade tilter, a simple device for fixing a lamp shade in any desired position. "Xcel" domestic products are in evidence, there being a number of cookers, irons, kettles, &c., on view. Messrs. Berry's are agents for Messrs. Nalder Bros. & Thompson, and a variety of the latter firm's instruments occupy one side of the stand. These include voltmeters, ammeters, power factor meters, wattmeters, reverse power relays, &c.

Messrs. Simplex Conduits, Ltd., show samples of their "household word" conduit and the new "Diaduct" distribution board, which is fitted with a removable trough which can be drilled to suit the purpose for which the box is to be employed. Every part is made to gauge, assuring interchangability. The bus-bars are of heavy section, high conductivity copper and provided with heavy cable sockets. A colliery lighting box is also shown. This can be adapted for any arrangement of cables and to any type of light, *i.e.*, well-glass, bulkhead, &c. The cables are taken through a brass cone and the armouring is clamped by a malleable iron grip. The interior can be removed entirely for wiring and re-inserted in the box. A watertight tumbler switch exhibited has the actuating knob out of centre, giving a smoother action and a larger break. In addition to these there are lighting fittings, ships' fittings, illuminated signs, domestic appliances, including "Plexsim" vacuum cleaners, irons, kettles, bowl-fires, &c.

The Vincent Switchgear Manufacturing Co. have a small but effective display of ironclad switches and fuse gear fitted with cartridge and Vincent patent replacement fuses. In addition to these, unmounted fuse elements are shown as well as ironclad distribution boards. A number of "B.K.B." motors, ranging from 1/100 to 2 h.p., appear on the stand.

The Excelsior Shade Manufacturing Co. have a brilliant and many-coloured show of shades of all kinds for gas and electric lights. There are also other lighting fittings, pendants, &c.

Messrs. David Shanks & Co., Ltd., also exhibit artistic shades and bowl fittings. A number of examples of Crooke's "daylight" glassware are shown.

Messrs. F. & C. Osler, Ltd., and Messrs. Faraday and Son, Ltd., have an imposing array of alabaster bowls, art shades, art metal wall brackets, pendants, and standards. Candelabra fittings and wall plates are also exhibited.

Electrical Conduits, Ltd., show a number of tubes and fittings for the protection of electrical circuits in buildings and ships; both screwed and slip type conduit are shown. Interchangeable and standard switch boxes and junction boxes, plain and mounted, appear on the stand.

Messrs. C. H. Parsons, Ltd., are displaying a number of their tumbler switches and lampholders in various styles and finishes in which they specialise. Examples of their "Britmac" switches are also on view. The main feature of these switches is the rigid insulating bar upon which the contact blades are mounted.

Messrs. Pinchin, Johnson, Ltd., exhibit a number of samples of "Formite," a synthetic resin, which possesses high insulating properties and is non-inflammable. The material is easy to turn and drill, and is acid-resisting. Compressed paper insulation and impregnated silk and cotton materials are also displayed.

Messrs. Best & Lloyd show ceiling fittings of all types, including alabaster and clear glass bowls, shades, and lanterns. There are also electric candle lamps and fires displayed.

The Etna Lighting & Heating Co., Ltd., show all kinds of lighting accessories, including wall and ceiling fittings, bowl fittings, &c. A number of soldering irons and flat irons are also displayed.

The Telephone Manufacturing Co., Ltd., have a number of automatic intercommunicating telephone sets for offices, factories, and ships. Many are fitted with secrecy keys to eliminate overhearing and interruption. A large display of accessories such as bells, terminal and junction boxes, also appears. The sets shown have a maximum number of connections up to 50, but additional lines can be provided for one-way communication. Decorative styles of inetrphone sets form another feature of the stand. In addition to the foregoing several types of indicators are shown.

Messrs. Gent & Co., Ltd., show their well-known "Pulsynetic" time standardising system in various forms. A marine transmitter is exhibited which, by a simple movement, will advance or retard the whole of a ship's clocks to meet the changes due to longitude. Another exhibit is a waiting train movement for a turret clock. In this the master clock is situated in a convenient position to control the gear mounted in the top of a tower. If the hands of any of the dials are retarded by snow or other obstruction the waiting train receives an impulse which carries it forward. A water level indicator and recorder similar to a set supplied to the Lincoln Corporation is shown. In addition to these, a wireless time-receiving set is shown in operation. This set is supplied with the "Pulsynetic" system if desired. The Parsons-Sloper secret telephone system is also given space on the stand as well as a "tell-tale" indicator for checking the movements of watchmen, &c.

Messrs. Balmford & Salt represent a number of firms and show the British "R.B." electric lighting plant. This is in operation supplying light to a number of points on the stand. Although of only .75 kW capacity, the set supplies a battery capable of running 15 lights for ten hours on one charge. The switchboard and starting gear are mounted on the set, and the method of starting up is simplicity itself. The set is provided with an automatic cut-out which operates when the battery has received its full charge, shutting the engine down. The plant occupies an extremely small space. On this stand is also shown the Tofield & Robinson "Triple-Auto" d.c. circuit breaker, a solenoid-operated device which automatically resets when the cause of an overload is removed. In this circuit breaker there are very few working parts and, therefore, little to get out of order. The apparatus is made in all sizes up to 50 A capacity. The "Scot" lampholder is exhibited; this has a one-piece casing and a simple method of fixing the shade. An "Imperial" electric toaster, complete with "flex" and adaptor, is also shown. The "V.C." lighting system for "Ford" cars which is exhibited consists of a small rectifier or converter, driven from the fan shaft, which converts the alternating current from the magneto to d.c. for charging a 10-volt accumulator with a capacity of 15 Ah. The rectifier consists of a metal case carrying a commutator switch and a slip ring. The switch is driven at twice the engine speed, and is built up of sixteen copper bars with mica insulation in between. Eight of these bars are active, while the remainder act as spacers. Alternate "live" bars are connected to a slip ring, which is in turn connected to the magneto. The other "live" bars are connected to an earthed ring. There are five brushes, one of which is in contact with the slip ring, the others being arranged in two pairs for taking up the rectified current, so that when one pair is upon the slip ring bars the other pair is earthed. An automatic mercury cut-out switches the accumulator in when the engine is started, and cuts it out when the engine stops.

The B.E. Co. (of London and Birmingham), Ltd., has a very comprehensive display of electrical accessories. Included in the show is the "Classic" desk light described in our columns a short time ago. This is now produced in a variety of finishes. Cables and wires, ceiling roses, tumbler switches, wall plates, &c., occupy a large part of the stand. The "Beco" fire is displayed, as well as a range of "Hendon" lamps of various shapes and sizes. The wood blocks and cases in which the firm excels are present in large numbers. Other exhibits are bells and indicators for various purposes, wall plugs, and dry cells.

Messrs. Thos. R. Carpenter, Ltd., exhibit lighting fittings, including shades, bowls, brackets, and standards.

Mr. John A. Harry Hunt has a similar display.

Messrs. William Sanders & Co.—This firm shows many examples of ironclad switch and fusegear. A set of unit-type switchgear is mounted on the stand. Battery switchboards for country house lighting sets are also exhibited.

The Falkirk Iron Co., Ltd., have a wide display of cooking apparatus, &c., among which are "Falco" cookers, heaters, and irons.

Messrs. Mark Webber, Ltd., exhibit several of their vertical engines, suitable for running on town gas, petrol, paraffin, naphtha, or benzole. These range from 2 to 18 b.h.p. A 5-b.h.p. engine, complete with dynamo and battery for country house or farm lighting, is shown in operation supplying a number of lights. A pumping set is exhibited.

The Austin Motor Co., Ltd., show one of their four-cylinder petrol engines coupled to a 3.1-kW English Electric generator, and a small .75-kW lighting set.

The Federation of British Industries has a large stand upon which are displayed numerous trade publications. This is a general information bureau for the assistance of members of the Federation, and for foreign and British buyers. Full information is given regarding British products and producers.

The Semaphore Engineering Co., Ltd., show dry cells for bells, telephones, ignition purposes, &c., and also complete electric lighting sets for motor cars and cycles.

British Brass Fittings, Ltd., exhibit a great variety of lighting fittings and accessories for all purposes, including tumbler switches, cut-outs, and main switches. Electric fires and radiators are also on view.

Premier Electric Heaters, Ltd., have a most brilliant display of electrical heating and cooking apparatus, all of which is very highly finished. A small electric cooker is

shown, as well as fires, kettles, irons, hot plates, glue-pots, &c. A notable exhibit is a small 600-watt radiator which has a frame so constructed as to permit of its being turned over and used for boiling small quantities of water. This is very suitable for standing on a desk or table.

Messrs. Parker, Winder & Achurch, Ltd., show examples of concrete mixing machinery, in addition to dynamos and small electric lighting plants. Switchgear and battery charging boards for small electrical installations also appear. Among the smaller exhibits are "Imperial" vacuum cleaners, electric light fittings, lanterns, &c. An electrically-driven floor polishing machine was on view the first day, but as this was of American manufacture it had to be removed. The firm has obtained a licence from the American makers to enable the machine to be manufactured in this country.

A large amount of space is occupied by examples of the work executed by disabled ex-Service men in the various training centres in and around Birmingham. Everything displayed is an eloquent testimonial both to the men and their instructors, and indicated very clearly how much can be accomplished in a short time by means of intensive instruction. The trades represented include armature winding, pattern making, turning and fitting, plumbing, cabinet making, watch and clock making, &c. The West Midlands scheme is providing instruction for about 2,500 men, and centres have been established at Birmingham (where 1,211 men are in training), Coventry, Dudley, West Bromwich, Ludlow, and Worcester.

Messrs. H. C. Slingsby, among a number of mechanical trucks, extension ladders, &c., exhibit an electrically-driven hoist. This is designed for a load of 15 cwt. The motor of this machine starts at no load, and an adjustable automatic stop is fitted which enables the load to be held at any desired height. This is specially designed for electrical operation, but electric drive can be applied to other hand-power types shown.

Messrs. W. Goodyear & Sons, Ltd., exhibit, among other trucks and small transporters, a "Greenbat" electric truck for industrial purposes. This is a 2-ton vehicle driven by a totally-enclosed, series wound motor, arranged for series parallel control, and supplied with power by a battery of 14 "Ironclad-Exide" cells. A pedal controls both the battery circuit and the brake so that the pedal must be depressed during the whole time the vehicle is in use. Should the driver fall off the pedal is released, cutting off the current and applying the brake. In addition to its 2-ton load the truck is capable of towing a trailing load of 2 tons on the level.

The M.P. Electric Welding Machine Co. exhibits a standard spot welding machine designed to obviate the use of rivets in jointing wrought iron or mild steel from the smallest gauge up to ¼ in. total thickness. The machine is fitted with a regulating device enabling several different welding temperatures to be obtained. The electrodes are of hard-drawn copper and easily replaceable. A water circulating system keeps the machine cool during operation, preventing excessive heating in the secondary winding of the transformer embodied in the machine. This transformer can be wound to suit single-phase circuits with frequencies ranging between 40 and 60 cycles and with voltages from 100 to 500.

The Midland Electric Supply Co. display Rayner and Heald induction motors, and Robinson electric lifting gear, including monorail hoists, winches, spur gear winches, &c.

Messrs. Henry Wiggin & Co. have a wide variety of resistance wires and metals. Nickel and cobalt anodes are shown as well as a large number of metal salts.

British Electric Vehicles, Ltd., exhibit two examples of their work. The larger of these is an electric locomotive weighing four tons, and capable of hauling a load of from 20 to 30 tons on the level or 8 tons on a 1 in 30 gradient. The motors are double-wound so that series-parallel control is obtained. The battery consists of 40 "Ironclad Exide" cells with a capacity of 258 Ah. The length of the locomotive is 9 ft. 7 in. over-all, and it has a 2 ft. 6 in. wheel base. It is capable of a speed of 5 miles an hour loaded, and will run from 20 to 25 miles on one charging of the battery. The other exhibit is a "Super Giant" industrial electric truck capable of moving a load of 5,000 lb. It has a loading space of 7 ft. 6 in. by 4 ft. The battery of 20 cells has a capacity of 161 Ah. The truck is steered by an up-and-down lever motion transmitted to the wheels by ball and socket joints; spring buffers minimise vibration on the steering lever. The control gear is mounted in a dust-proof case, and the controller unit is easily removable, as it acts through a dog clutch.

The Birmingham Mica Co., Ltd., is displaying a comprehensive range of mica and micanite in various forms. The show includes sheets, washers, and bars, as well as special forms for particular applications.

Messrs. Wm. Whitehouse & Co., Ltd., exhibit one or two lighting fittings, their stand being in the nature of an invitation bureau where facilities for visits to their works are given.

Messrs. Accles & Shelvoke, Ltd., show a number of small motors ranging from 1/10 to ½ h.p. Also a patent dynamotor for plating and polishing, and a small dynamo suitable for lighting small cars or motor cycles.

Electric Heating & Hardware, Ltd., exhibit many "Komet" productions, including kettles and irons. A feature of this stand is a cylindrical electric oven. This has an aluminium barrel about 20 in. in diameter and length, with a lid secured by three patent buckles. The back of this barrel is domed, and in the space thus provided two 500-watt spirally-wound heating elements are fixed. A galvanised steel frame fits into the barrel and has a flat bottom upon which the dishes containing the food to be cooked are placed. It is claimed for this oven that the distribution of heat by the interior arrangement makes it far more efficient than the rectangular type.

The Gath Electrical Engineering Co. displays several examples of lighting standards and lanterns which, though plain, are of very effective appearance. The lantern frames are all of cast brass. A great deal of metal work in the form of bell pushes and ceiling and wall plates occupies the front of the stand. A new patent switch plug is shown; this is a double-pole, quick-break, rotary type switch fitted with large plug sockets. The plug has two pins and a key projection, and when the switch is operated, by means of a handle on a spindle passing through the plug, the key turns in a slot in the switch case rendering withdrawal of the plug impossible until the switch is put into the "off" position. This combination is made in several styles for mounting on wood blocks, sunk type with a deep recess at the rear for cables, and a type suitable for installation in exposed positions.

Messrs. Watts, Williams & Co., Ltd., exhibit "Wattalite" electric lighting sets for motor and other bicycles. In the motor cycle set a small dynamo fixed above the tank of the machine is driven by a flexible shaft from the rear wheel. The dynamo is connected to an accumulator which supplies current to a 5-in. head lamp and a small rear lamp fitting through the number plate. The whole of the switches are contained in the dynamo casing. The cycle-lighting set consists of a dynamo and head and tail lamps. The dynamo is driven by a rubber friction wheel in contact with the rim of the front wheel of the cycle.

Messrs. Singleton & Rome have an excellent display of artistic lighting fittings consisting of brackets, pendants, &c., in all kinds of metal finishes, shades, and bowl fittings. "Bipol" accumulators are also shown in various sizes. A travelling light comprising an unspillable accumulator in a strong wooden case, a policeman's or watchman's lamp, for use continuously, or as a flash lamp, charging racks, &c., are exhibited.

Messrs. Drake & Gorham, Ltd., have a "Railodok" electric industrial truck on view. This has a carrying capacity of 1 ton and a loading platform measuring 7 ft. by 3 ft. 4 in. It is driven by a 1½-h.p., series wound, totally-enclosed motor, which receives its power from a battery of 21 "Ironclad Exide" cells with a capacity of 150 Ah. The vehicle is fitted with a drum type controller, with a patent locking device and cut-out. The cut-out is interlocked with the driver's saddle, the latter being reversible. This renders it impossible for the truck to move unless the saddle is depressed. This firm also exhibits an adjustable girder fitting for electric lighting. This is an extension arm made in one, two, or three parts, and a special spun steel, vitreous-enamelled reflector. The arm may be fitted on the slide rest of a lathe so that the part of the work being operated upon is always illuminated.

Messrs. McKechnie Bros., Ltd., The Metallurgical Co., Ltd., and The James Bridge Copper Works, Ltd., show copper and other non-ferrous metals in various forms as ingots, bars, rods, &c.

The Hoover Suction Cleaner Co., Ltd., effectively displays and demonstrates several of its cleaners.

Messrs. Evered & Co., Ltd., among many examples of highly decorative brass work, exhibit a number of electric lighting standards, brackets, and pendants, as well as bowl fittings and artistic shades and vases.

Messrs. Scholey & Co.'s stand has upon it a number of fractional h.p. motors in a number of applications including "Kutmore" drills, grinders, &c. Special prominence is given to the "Croydon-Premier" electric suction cleaner which can be employed for cleaning carpets, curtains, clothes, cushions, &c., without endangering the fabric.

The Electric Appliances Co., Ltd., specialise in the "Eureka" vacuum cleaner and its accessories, which include a carpet brush, a flat tool for corners, a hose for suction or blowing, tubing, brush, and nozzle.

The Consolidated Pneumatic Tool Co., Ltd., is not giving much prominence to the electrical side of its manufactures, but one or two portable drills and grinders are displayed.

Messrs. Galloway, Ltd., have a number of boiler house appliances upon their stand. These include an accessible wrought steel superheater, steam junction valves, safety valves, and a water softening apparatus, and Milner-Hurd's patent boiler seating blocks which move as a boiler expands or contracts, preventing the breaking of brickwork.

Messrs. Alfred Herbert, Ltd., exhibit a very well-placed selection of their precision work, including a patent universal gauge measuring machine for measuring lengths, diameters, screw pitches, internal and external, &c.

The names of other firms exhibiting articles of an electrical or allied nature were listed in our last issue.

Spain.—A new bank has been founded at Madrid with a capital of five million pesetas under the style of Banco Hispano-Suiza para Empresas Eléctricas.—*Reuter's Trade Service.*

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Single-pole Splitters.

Electric Brass Wares, Ltd., Brakell's Buildings, Rainford Gardens, Button Street, Whitechapel, Liverpool, have drawn our attention to a range of single-pole splitters which they are manufacturing. These are made for any number of ways from 2 to 6—the 2-way type is illustrated in fig. 1. The case of the splitter is of cold rolled pressed steel and is asbestos lined. The bases are made of a special non-hygroscopic

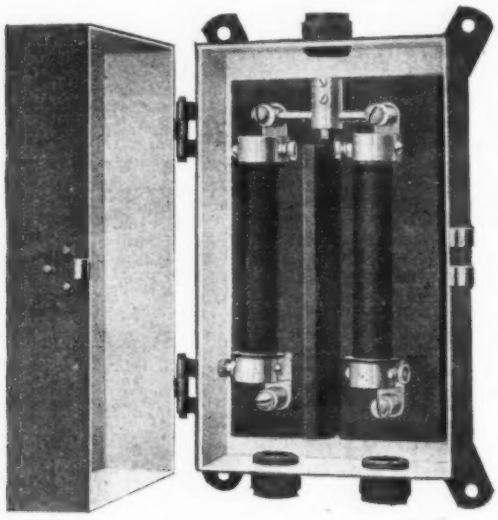


Fig. 1.—Single-pole Splitter.

material capable of withstanding from 10,000 to 13,000 V per mm. thickness. The advantages claimed for the device are that as there is no cast iron or porcelain in its construction it is practically unbreakable; it is light and easily fixed; it has permanent bushes, and heavy copper contacts, and it is absolutely fireproof.

The "Wild-Barfield" Thermostat.

The increasing demand for a closer automatic temperature control for electric ovens and other apparatus has resulted in the production of a new thermostat which can be set for temperatures up to 400 deg. F. A capsule filled with a volatile fluid is made by its expansion to switch off a part of the heating element as soon as the full temperature is reached.

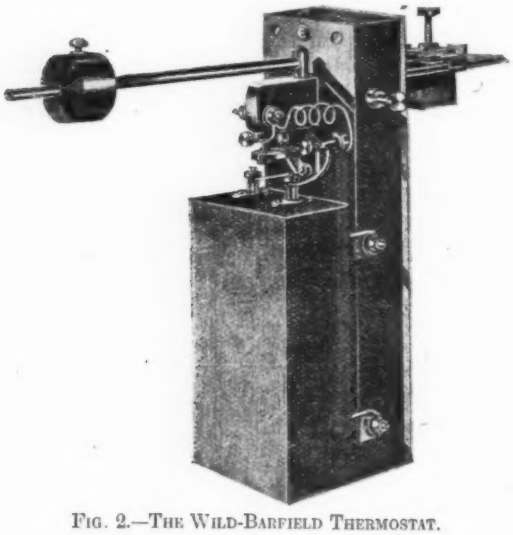


Fig. 2.—The Wild-Barfield Thermostat.

Afterwards the full current is switched on and off intermittently, so that a very steady temperature is maintained in the oven, or other device controlled. The exact temperature to be maintained can be adjusted to a nicety by altering the position of the weight on the lever which projects outside the oven (fig. 2). Contact is made outside the oven, so as to guard against any explosion or ignition should the articles being dried give off an inflammable gas.

The Wild-Barfield thermostatic temperature control with slight modifications can be adapted to numerous electrically-heated devices, and should open up new channels of business which have hitherto been restricted by the difficulties encountered of easily and safely controlling temperatures within desired limits. For the purpose of illustrating the device, the cover has been removed. The controlling apparatus is manufactured by Messrs. Automatic & Electric Furnaces, Ltd., 281-283, Gray's Inn Road, London, W.C. 1.

An Anti-vibration Fitting.

We have received from the Screwless Grip Fitting Co., Lower George Yard, Halifax, details of a new type of fitting for protecting electric lamps from injury due to vibration. This may consist simply of a spring with a screwless corp grip, as shown in the central diagram in fig. 3. A counter-weight and a flexible metallic tube can be supplied to

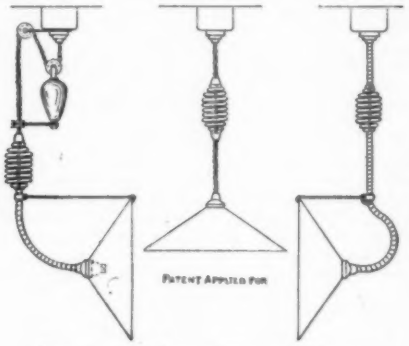


Fig. 3.—An Anti-vibration Fitting.

fit over the lamp "flex" from the spring to the lampholder, as in the left-hand side of the figure. A third variation, shown on the right-hand side of fig. 3, is the fitting of two lengths of flexible metallic tube. In this method the tube takes all the weight of the lamp and shade, leaving the "flex" entirely free.

A New "Outlet" Device.

A newly invented device, which is being developed by the Electric Outlet Co., of New York City, consists of a new style of outlet and a new plug with curved blades, which supports the fixture and makes the proper electrical connection at the same time. The new outlets may be placed in either walls or ceilings wherever a light can possibly be used. Generally more outlets will be put in than ordinary lighting conditions require. The wall outlet is marked by a neat

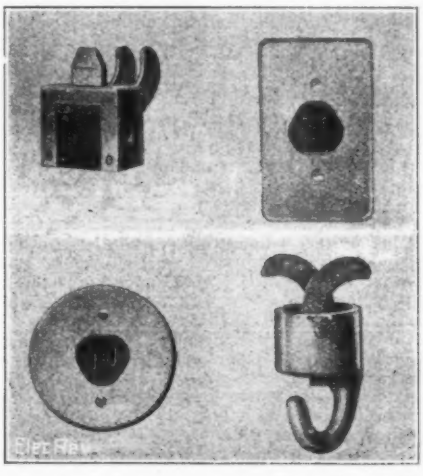


Fig. 4.—Wall "Outlet" (above) and Ceiling "Outlet" (below).

brass plate with a rounded triangular blade centre, fig. 4, and will accommodate the standard parallel blade plugs now commonly used with cord connections. An inconspicuous brass plate marks the ceiling outlet. This installation finishes the

work of the electrical contractor. It will not be necessary to call him in to put up, take down, or shift a light, except in the case of the heavier and more elaborate fixtures.

The plug is attached to the light itself. When it is thrust into the outlet the curved blades point upwards and are capable of holding the heaviest fixture. For the more elaborate wall fixtures the plug is not rigidly attached to the fixtures. In this case the wall fixture is hooked over the plug after it has been inserted in the wall receptacle. In wiring the plug to the wall light, enough slack is left to allow the fixture to be readily hooked and unhooked with the plug in position. The blades of the ceiling plug curve outward like the ends of an anchor, and to shift a fixture, all the user needs to do is to lift the light off the outlet.—*Electrical News.*

A New Trolley Runner.

Mr. A. Harwood has sent us a drawing and particulars of his patent trolley runner (No. 113,091). This is designed to eliminate the trouble experienced in replacing the runner on a wire when the wheel is turned at an angle to the wire. The head has a self-lubricating conical seat, and is stated to be free from all rocking.

THE TEMPERATURE LIMITS OF LARGE ALTERNATORS.

Discussion at Manchester.

Mr. G. A. Juhlin's paper on the above subject, which was abstracted in our issue of February 4th, was discussed before the North-Western Centre of the Institution of Electrical Engineers at Manchester on January 25th.

Prof. Miles Walker was of the opinion that the paper gave exactly the data which were wanted, not only by the designing engineer, but also by the operating engineer. Everyone had known for a long time that mica insulation had very good ability to withstand high temperatures, but they wanted to know exactly what would happen if they constructed a coil according to certain methods known to manufacturers and subjected that coil to, say, a temperature of 150 deg. C. for a long time. Now they had some exact data, and it was an illustration of the enormous value of a well-organised experimental department in a great manufacturing works where a man could be kept on a line of research until he had got satisfactory results. Mr. Juhlin's formula for calculating the temperature rise he admitted was not quite applicable (the speaker referred to fig. 4), because as a matter of fact the heat did travel partly along the copper, but mainly through the slot insulation. The speaker had thought it worth while to tackle the problem of how much heat passed through the insulation, and how much along the bars for various lengths of the machine, and he had plotted a curve from the formula. (Prof. Walker explained a diagram thrown on the screen.) Until he worked out the figures he had no idea that in a stator of 30 in. they could get so much reduction in temperature. The formula was a very simple one, and it was quite easy in any case to fill in the values of the constants and determine the actual temperature. As regarded the measurement of the temperature inside the machine, he had sometimes wondered why the proposition had not been considered of having a thermo-couple halfway or a third of the way in the tubing. There would be no difficulty at all, particularly in the part of the machine where they did not require as much insulation, and with a thermo-couple in there they could get as good a determination with it as if they made a direct reading with an instrument so that a man could see exactly what the temperature of the machine was. With regard to how high a temperature one should work at, he did not quite agree with Mr. Juhlin. So far as the rotor was concerned, there was not the slightest doubt that as long as they were working at a temperature which was proved to be a perfectly good temperature for a rotor to work at, with proper mica thermal insulation, then everything was to be gained by working with copper. But with regard to the stator they had another thing to consider. Suppose the insulation could be made absolutely sound so that even when working at 150 deg. C. nothing could be said against it on that score. Still there arose the question of efficiency. In dealing with that, they must take into account the eddy currents as well as the normal losses. They knew that if they increased the copper in a slot they increased the eddy current, so in some ways the engineer was tempted to say: "Well, we will have as much copper as we can; we will work with abnormal current density and keep down the eddy currents; in that way we are not exceeding our temperatures and we will have a good machine." But there were some things to be considered in days of high-priced coal, and when they knew pretty well how to keep the eddy currents down to a small amount. He did not mean those eddy currents caused by the current in the conductor itself, but those caused by the saturation of the teeth, which were sometimes far more important than the others. Those were things which must be taken into account when they considered increasing the copper, but nevertheless it was possible by sufficient lamination to increase the copper. A 20,000-kW machine of normal design working at fairly high temperatures would take about 2 tons of copper, which could be obtained at a cost for labour and material of about £600. On the other hand, they could reduce the loss by about 40 kW, which, taking £600 at 10 per cent. was £60 a year; on the 40 kW they gained about £350. The annual cost of the power wasted in the copper was five times as much as the interest on the extra cost of the machine. In a stator there was always plenty of room, and they could make the slots they required, but with the rotor they were limited, so he would like to see, first of all, very perfect lamination of the copper, and then the copper arranged so as to produce the most economical machine, not merely from the point of view of the cost of manufacture, but also from that of the cost of manipulation, plus cost of operation. At the present time the buyer did not pay sufficient attention to efficiency, if he did so he could revolutionise the electrical industry. If he was offered two machines, one at £1,000 and the other at £1,050, both by good makers, he would take the former, and would hardly take into account a matter of one-half per cent. more or less efficiency. If the buyer would really consider what efficiency meant, and insist upon manufacturers making highly efficient machines, he would obtain better results, but as it was, the manufacturer knew that if he put a machine on the market at a price 10 per cent. higher than the other man he would not be able to sell it. How many shunt motors had the amount of shunt copper which was actually economical, the amount required from the point of view of really efficient working, not from that of price? One could put three times the amount of shunt copper into an ordinary motor, and it would pay for the copper in the saving effected. Should they not consider the subject from the point of view of complete efficiency and the ultimate cost rather than from the simple manufacturing point of view? He agreed that the temperatures Mr. Juhlin suggested were quite possible, and the paper would reassure operating engineers whose temperatures were fairly high.

Dr. S. F. Barclay was of the opinion that Mr. Juhlin had not made quite clear the relationship that his proposals bore to present-day practice. He proposed to run machines with a higher temperature rise than was at present permitted, and rightly pointed out that actual "hot-spot" temperatures exceeded considerably the rise specified for measurement by thermometer. He referred to a hot-spot temperature rise of 78 deg. C. above the cooling air for a 6,600-volt machine, and of 98 deg. C. for a 10,000-volt machine. He pointed out that although those figures might appear to be high, if the temperatures of existing machines were measured they would probably be found to be in the neighbourhood of those figures, if not higher. Most people would be inclined to agree with Mr. Juhlin's opinion with regard to the actual temperatures of machines built and passed to the conventional specification of 40 deg. C. rise measured by thermometer, but how did Mr. Juhlin reconcile that opinion with his proposal to "increase" the temperature rise to 75 deg. C. (actual temperature)? Clearly, he was recommending the adoption of a specification that would ensure "hot-spot" temperatures being lower than he considered they were at present—a state of affairs that was not consistent with the substance of the paper. In connection with Mr. Juhlin's proposal to measure the temperature of the rotor winding by the resistance method, in consequence of the good cooling of the part of the rotor winding that was embedded in the rotor, and the relatively poor cooling of the part of the winding that was enclosed by the end bells, the "hot-spot" temperature of the rotor must be considerably greater than the average temperature. Clearly, then, so far as the insulation was concerned, and it was from that point only that Mr. Juhlin considered the case, the temperature rise that was suitable for the stator where the "hot-spot" temperature could be ascertained fairly accurately, was excessive for the rotor in which the "hot-spot" temperature was absolutely an unknown quantity. Mr. Juhlin might b disposed to consider that the difference between the average and the maximum temperatures of the rotor should not be very great with a well designed machine, but if his proposal were adopted it would be applicable to badly designed as well as to well designed machines. For that reason the speaker's considered opinion was that an ultimate limit of temperature of 160 deg. C. for the rotor as determined by the resistance method was excessive. The speaker considered that the most important quality of all was reliability of operation; for generating plant reliability should have the first consideration from all concerned, and to impair that first essential for any small gain in first cost or efficiency was an unsound policy. An unduly high percentage of failures of turbo-alternators continued to take place from unknown causes, and it might quite well be that relative movement due to large temperature variations might account for some of those failures. Before higher temperatures were adopted it was important that the matter should be considered from other standpoints than merely that of the suitability of the insulation to withstand high temperature.

Mr. A. B. Field explained that by specifying a low temperature rise measured by resistance the whole direction of design was biased, and the manufacturer no longer had a free hand to do the best he could. Efficiency was a very important feature, and they should distinguish very clearly between temperature limits introduced by considerations of insulation and those due to such considerations as Prof.

Walker had brought forward; they were absolutely distinct. Let the purchaser give the manufacturer sufficient freedom with regard to temperatures and insulation, and call for the very best efficiency he could get, then he would get more efficiency with a smaller amount of copper than by putting a big amount of metal in the centre. At all events, they were two distinct problems, and they should be kept distinct. With regard to the rotor temperatures, the temperature limit dictated by the insulation was one that they were not interested in at all. By leaving the temperature to the manufacturer he would be limited to a lower figure than the temperature that the insulation would stand, and in the revision of the B.E.S.A. rules it would be quite rational to say that as regarded turbo-rotors there was no temperature limit from the point of view of insulation, and therefore, on the insulation tables no temperature limit need be given. If desired, it might be added that from other points of view practice had shown that a temperature rise of 100 deg. C. or so did not introduce serious trouble. He did not think it was realised in this country that the American Institute's Standardisation Rules did not represent the conditions under which a very large proportion of machines in America were sold and bought.

Mr. A. E. Clayton said that when they were told that a 10,000-volt machine had a temperature rise of 98 instead of 40 deg. C., it became obvious that any rating based on temperature measurement by thermometer was quite hopeless. With a thermo-couple they could undoubtedly ascertain the temperature in a particular spot very accurately, but it seemed that the resistance method was rather more robust. In the case of a rotor the author had only allowed 10 deg. difference between the temperature of the hottest part and the temperature measured by increase of resistance. The author's conclusion was that 160 deg. C. was a safe temperature at which to run mica insulation, but should he take 150 deg. measured by the resistance method for the rotor, that would result in a temperature well over 200 deg. being attained in many cases, depending partly upon whether axial or radial ventilation was used.

Mr. G. F. Sills pointed out that the author's coils which had been tested appeared to be composed of four conductors per slot. Presumably those conductors were not in parallel, and if so there was mica between each individual conductor. In a number of instances in the past, although the slot insulation surrounding the conductors had been mica, the insulation between the conductors forming the coil had not always been mica, and in view of the high temperature suggested it would be necessary to have all mica. Water-wheel generator coils, at any rate so far as the rotor was concerned, would be working under more favourable conditions than a turbo rotor. One speaker had calculated that by using extra-high-temperature on a 20,000-kW machine, one could show a net gain of about £250 a year, but when the capital cost of a complete 20,000-kW set and its auxiliaries was taken into consideration a saving of £250 a year would not influence a buyer if it would in any way affect the reliability of the set. With reference to the author's remarks regarding meeting foreign competition, it should be possible to put forward higher temperature machines for export where foreign competitors were doing the same, supplying the lower temperature machines to the home market, until such times as engineers in this country were willing to use higher temperature machines. With the extra-high-temperature machine it might be necessary to have a larger air filter, which would occupy more space, and with present building prices that might offset the reduction in price of the higher-rated turbo-alternator.

Mr. B. G. Churcher, referring to the use of the resistance thermometer, thought it would be found that the argument of robustness would not work out because they could use thick thermo-couples sufficiently strong to stand ordinary shop usage, whereas when using the resistance thermometer in order to get sufficient resistance in the arm of the bridge which formed the resistance element, they had to use very fine wire so as to get it into a small space. In that way the resistance thermometer would probably be no better than an ordinary mercury thermometer. The statement that they could measure surface temperatures accurately by means of a thermometer seemed to be not quite accurate. Thermometers were calibrated by being immersed in a liquid, and they had to correct the emerging column. For commercial testing that might do, but when they were to measure surface temperatures if they placed the thermometer against the surface they would be measuring the temperature of the air just outside the surface, plus a certain amount of radiation from the surface. The use of pads introduced abnormal conditions. The speaker had tried to measure the temperature rise of a commutator by putting a thermo-couple and a thermometer on to the commutator at the same time. In one case the thermometer read 56 and the thermo-couple read 71, which was simply due to the thermometer really reading the temperature of the pad, not that of the commutator, and the temperature of the pad was nothing like the temperature of the commutator. The only real way to get surface temperatures accurately, especially where there was any air blast, was to use thermo-couples and sweat them on to the surface, by which means perfectly satisfactory results could be obtained.

Mr. Baxendale explained that last year they opened up a generator rotor which was manufactured some seven years previously; it was actually as good as the day it was put in, and it seemed to be quite good for another ten years, so he would stick to low temperature. With regard to the junction of the end connections, if the copper expanded at all it would certainly break the joint there and the insulation of the end winding would suffer as well. Ordinary Empire cloth would carbonise in a very short time, and they very often found in drying out a machine that if the temperature became a little high the varnish came out in small bubbles, with the result that the insulation was apt to become very low. With regard to the rotor running at higher temperatures, trouble would be experienced with mica insulation, which was not extended far enough away from the cores, and when the insulation was asbestos, they were apt to part joints there, with the result that they would probably get an earth on the rotor in addition to any moisture coming over the wet filter.

Mr. F. Walker remarked that if they took the charges made by any of the big undertakings they would find that interest and sinking fund absorbed 50 per cent. of the total. If the charge made was 2d. per unit, 1d. would represent the sinking fund and interest; the alternator perhaps represented nearly 5 per cent. of the capital charges. Suppose they added 10 per cent. to the cost of the alternator, the interest and sinking fund would go up by ½ per cent., which represented ¼ per cent. of the charge per unit. On the other hand, a 10 per cent. increase in efficiency would reduce the cost per unit by 2½ per cent. Those round figures made efficiency ten times as important as the capital cost from the point of view of the cost per unit.

Mr. R. Johnson thought that higher temperature limits would force manufacturers to adopt mica insulation more widely, with the result that reliability would automatically depreciate.

Mr. G. A. Juhlin, in reply, asked: "Why should we blink our eyes to the fact that high temperatures are there, always have been, and always will be there?" They could not build machines with an internal temperature of 40 deg. C. Unless operating engineers accepted the fact that there existed very much higher temperatures inside a machine than they could measure by a thermometer, they would not get any further. The high-temperature machine would be more efficient than the low temperature machine, and it depended entirely on the design of the machine what the temperature distribution in the rotor would be. With a well-constructed machine and end windings properly ventilated there was not the enormous discrepancy between the hot-spot temperature and the average obtained by resistance, which some speakers had tried to indicate. Moreover, there were plenty of machines built on a 40 deg. rating, which had been operating for years very much beyond some of the limits which had been suggested. In actual practice he did not think anybody need lose any sleep over the subject of copper expansion. Any piece of insulation when new was absolutely solid, but they had to have certain clearances in getting the bars into the slots; those clearances were absorbed by expansion of the insulation, with the result that they had always got a certain amount of, not clearance exactly, but elasticity in the insulation. The insulation swelled, there was no question about that, but they must also remember that even with mica (and mica there had a very great advantage over any other insulation that could be used because the copper could slide in the mica) although it might be ever so tightly pressed, they had not got the same grip on the copper that they would get with any fibrous material; practical experience would show that there was not much danger from expansion. They had to consider actual operating conditions and specify machines accordingly. Though the standardisation rules had been accepted by American manufacturers they did not work to them. The only reference in the paper to water-wheel generators was the fact that certain coils were taken from these machines. They were not intended as an example of how turbo-generator coils should be taken; they were simply taken because they happened to be there and were useful for experiment. There was nothing but mica from the bar copper to the outside, so that the limits which held good for the insulation to ground would also hold good for the insulation between turns, and it was far more important to have mica insulation on the individual turns because that was the position of hot spots in connection with the copper. Concerning the influence of temperature on paper, at least one manufacturing company in America did not use paper, but varnish, and breakdowns were very few indeed. With regard to the expansion of the core bolt, the core was elastic, and it would expand far more than the bolt; the expansion of the bolt was not very much. There was a temperature gradient from the copper to the core, and a very considerable one; therefore, the core temperature was very much lower than the actual copper temperature. He was quite satisfied that it was correct that an efficient machine with a high temperature required a smaller filter, instead of a larger one; total losses must be less if they could get a higher efficiency out of a given machine. Mr. Sills suggested that they should use a high temperature limit for machines which had to meet foreign competition and keep to low temperature limits on machines for use at home; from a manufacturing point of view this was not practicable. "Where have you built machines similar to this? Where can we see them?" were the first questions British engineers asked, and engineers were not so very different in other parts of the world. When they used mica, why should they stick to temperature limits which were obviously

laid down for machines constructed with other material? It was not the same thing at all. If they had the material to withstand the higher temperature he thought it was up to everybody to use it to some extent. There was not the slightest doubt that the further they went the more mica would be used in the construction of electrical machinery. Probably the day would come when they would use nothing but mica, or perhaps by that time they would have found something even better than mica.

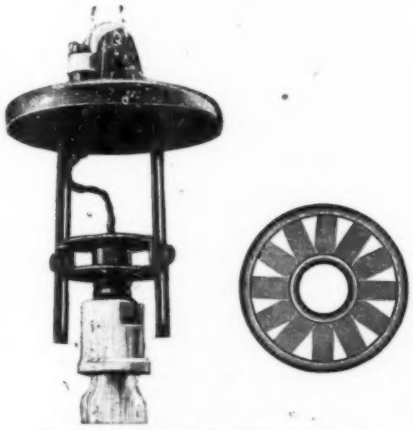
SOME SPECIAL LIGHTING FITTINGS.

The "Anti-break" Lamp Economiser.

There has always been, and more especially so under present conditions with the life of lamps shorter than it might be, a drawback to the universal use of high-efficiency metallic-filament lamps. That is, the fragile nature of the filament results in a reduction of the length of life of the lamps even when they are subjected to the slightest vibration, and when any perceptible vibration, or liability to shock, exists it is often impossible to use them, as the cost of their renewal might outweigh the advantages accruing from their use.

It is for the purpose of overcoming the above-mentioned and similar problems that the "Anti-break" lamp economiser (Ross patents) has been designed. The device, as already illustrated in our pages,* takes the form of a disk composed of two concentric rings connected by a plurality of strips of phosphor bronze gauze cut on the bias with the warp and weft strands disposed obliquely, so that the diagonal of the mesh runs in the direction of the length of the strip. The gauze strands are firmly fixed at their ends to the inner and outer rings of the disk; there is no actual connection between the two rings, the inherent friction of the weft and warp carrying the weight of the lamp and holder. A suspension is thus provided which is inert to the transmission of vibration as there are no wires running direct from the outer fitting to the suspended lamp, through which vibration can pass; in other words, the interrupted mesh of the gauze strips destroys, or damps out, the waves of vibration before they reach the fragile filament. At the same time the lamp is held rigidly in place, and even under the most severe shock the natural resilience of the disk damps the wring, or rebound, owing to the interwoven mesh, and prevents the filament being destroyed.

The device, owing to the corrugated nature of the warp strands interwoven with weft strands, is exceedingly strong, and possesses the further advantage that it is not affected by the heat of the lamp or atmospheric conditions. It has been tested under vibration from running machinery in engine rooms, over propellers on board ship, and under vibration



Figs. 1 and 2.—Ross Anti-vibration Disks.

set up by a pneumatic hammer on a steel plate, to which the fittings have been attached, and it has been subjected to gun fire shock on board naval vessels.

In practice it is found desirable to use two of the anti-vibration disks rigidly connected together as illustrated in figs. 1 and 2, in order to prevent the sway which otherwise would take place with the long gasfilled lamps; provision may be made for focusing the lamp if required, and the Engineering & Lighting Equipment Co., Ltd., claims that gratifying results have attended on the development of the Ross anti-vibration disks for use with gasfilled-lamp fittings. An important city in the north of England has found in actual use that gasfilled lamps suspended from tramway poles have shown 100 per cent. longer hours of burning when fitted with the device. Moreover, numerous fittings are being used on jib and travelling cranes, and in other positions where hitherto it has been impossible to employ gasfilled lamps with any degree of reliability.

For instance, in fig. 3 is shown the "Tilbury" lamp, which it is claimed was the first cargo vessel fitting to use a gasfilled lamp; this is becoming popular in shipyards, and when the rough usage to which such fittings are subjected in shipyards is considered, it will be appreciated that the anti-vibration attachment must be doing its work well. An alternative to the single lamp fitting is the "Shiplight," fig. 4, which is provided with several b.c. lampholders mounted on "anti-break" disks, and is supplied already wired and provided with two brass terminals for connection to the existing supply cables.

Fig. 6.—"Defiance" Fume-tight Fitting.

A further application is the "Keelite," fig. 5, which has been specially designed for the purpose of projecting a flood light on to the keel of a vessel when in dry dock, where the standard practice is to clamp the fitting on to any convenient stanchion wherever a light may be required, and it will be noticed that the top of this fitting is provided with a ball and socket universal joint so as to allow of the lamp being tilted in any direction that may be required.

The "Defiance" fitting, fig. 6, is appropriately named, since it has been designed for use in cases where it is essential to provide a water or fume-tight lamp, such as in chemical works or in ships' stoke holds where oil fuel is used, and where fumes of a dangerous nature may be encountered. It consists of a solid cast-iron top having radiating fins both inside and out, the opalescent globe being held in a V channel ring, and is thoroughly gas-tight throughout. It has been found on actual test, we are informed, that the above-mentioned fins provide a sufficiency of radiation, and no undue deterioration of the gasfilled lamp has been noticed. This type of fitting is used by the British Cellulose & Chemical Manufacturing Co., Ltd., and it is also used for lighting the engine room of the s.s. *Aquitania*. Finally, it might be mentioned that the "Bradford" lamp, as its name implies, is used for colour-matching purposes by woollen manufacturers and in dye works. It consists of a suitable lantern in which are fitted three specially tinted glass screens through which the light of a gasfilled lamp is filtered, and it is claimed that the resultant light, in effect, is as near as possible to north light.

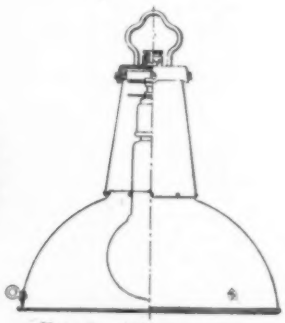


Fig. 3.—"Tilbury" Shipyard Fitting.

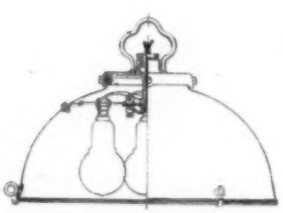


Fig. 4.—"Shiplight" Cluster Fitting.

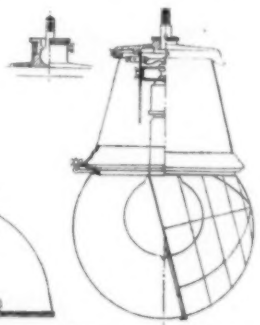


Fig. 5.—"Keelite" Flood-light Projector.

* Elec. Rev., Feb. 7th, 1919, p. 148.

ELECTRIC TRACTION.

Sir Philip Dawson's Views.

An extremely instructive lecture on the above subject was delivered by Sir Philip Dawson to the senior students of the Faraday House Electrical Engineering College, on February 23rd. Mr. G. W. Partridge (an old Faradian) occupied the chair, and in introducing Sir Philip explained that the latter had had unique opportunities of studying the subject, as he had inspected practically every electrified railway system in Europe and America. Moreover, as he spoke three or four languages fluently, he was able to discuss technical matters with engineers of various nationalities, and so obtain first-hand data. There was no doubt that the near future would see an enormous development of electric traction in this country; the Brighton railway was to be extended to the coast, and the Great Eastern Co.'s system would also be converted before long. It was gratifying to know that the electrical engineer to the L.B. & S.C. Railway was an old Faradian, and it was not too much to hope that another Faradian would be put in charge of the Great Eastern Co.'s system. A point that should never be forgotten was that it was worse than useless to attempt to consider any railway electrification scheme from the engineering point of view if the commercial standpoint was neglected.

Sir Philip Dawson regarded it as the duty of all experienced engineers to assist the younger generation by every means in their power; it was only by so doing that the young men could hope to compete with their rivals. He had come in contact with engineers of all nationalities during the 30 years he had been connected with electric traction in its various phases, but he was always prepared to back his countrymen. Tramway electrification had reached the end of its development, and would provide comparatively little work for manufacturers in the future, whereas railway electrification had only just begun, and there was an enormous amount of work to be done.

There were two main systems, viz., d.c. at from 600 to 3,000 volts, and a.c. single-phase at any pressure up to 16,000 volts. An a.c. 3-phase system was used on the Continent by the aid of split-phase loccmotives, but now regeneration was possible with all three systems, and the latter one had lost its particular usefulness. Standardisation was very useful, but if carried too far it might result in more harm than good being done; in that connection the report of the Advisory Committee to the Ministry of Transport must be considered as reasonable, and the L.B. & S.C. system was wisely to be retained so as to accumulate data and experience, especially as no main line had as yet been electrified in this country. It was very unwise to slam the door in the face of improvement as France had done, and the lecturer read an extract from an eminent American engineer's letter expressing the opinion that France had gone too far in standardising the h.p. d.c. system. Such procedure could only mean one of two things at the present early stage, *i.e.*, either the engineers responsible were not capable of differentiating between the advantages of various systems for the particular railway to be converted, or else manufacturers of certain classes of equipment wished to exclude all competitors. Actually each line to be electrified should be considered on its merits, and a system chosen which would best suit the particular conditions. Nearly every country on the Continent was considering the subject at the moment, but none intended to standardise to the degree that France had done, and in the U.S.A. they were of the opinion that they could not standardise until more experience had been gained; they were accordingly developing various systems at the same time. Of course, in some countries the problem could be easily settled, in Belgium, for example, where the distance between towns was short, the traffic dense, and the lines comparatively short, the d.c. system would probably be the best to adopt. The whole thing resolved itself into terms of capital, working, and maintenance costs; railway electrification was a financial problem entirely, and all the best engineering in the world would not make a scheme a success if it was not sound commercially and financially.

An important point that required settlement was the permissible p.d. in an earth return system, but that subject was now being considered by the Ministry of Transport's Advisory Committee, of which the lecturer was a member. Interference with telegraph and telephone circuits had been made too much of a bogy in the past; on the Brighton line and in Sweden it had been eliminated entirely, but there again it was a question whether the cost could be justified.

The lecturer emphasised the fact that the whole problem was a financial one, pointing out that before the war the cost of electricity consumed equalled 50 per cent. of the total cost of operating an electric railway, and it would, therefore, be appreciated that energy must be supplied as cheaply as possible. A full train starting from Victoria station might require as much as 2,000 amperes, and he was giving away no secret when he stated that the Electricity Commissioners realised that of the total amount of electricity that would be produced in the provisionally-delimited London and Home Counties Electricity District half would be consumed by the railways. The Brighton railway would require between 40,000 and 50,000 kW on the three-hour basis, while the Great Eastern Co.'s system would involve a generating station of about 150,000 kW capacity; railway electrification would, therefore, result in the consumption of large amounts of power which would have to be supplied by stations of large size. For a large railway system the load factor could be taken as 40 per cent., and for London the diversity factor was only a few per cent., but there was really nothing in the latter.

The lecturer next dealt with power-house design, pointing out that steam pressure would be increased to 350 lb. per sq. in., and that there was no advantage in installing individual turbo-generator sets of too large a size, and then passed on to the subject of cables. Sir Philip mentioned that the American G.E.C. hoped shortly to produce a 3-core h.p. cable, but, personally, he preferred to use three single-core cables without any protective devices; such devices were only needed to disconnect the generators, modern cable being able to withstand any surges that might arise. That view had been confirmed on the Continent where three single-core cables had been laid underground in concrete ducts. They had recently tested pieces of the 30,000-volt, 25-cycle, single-core cable that was supplied for the Brighton railway system, and it had withstood a pressure of 200,000 volts at 50 cycles for three hours, after being under water for 24 hours, without showing any signs of breakdown. Moreover, a similar piece of cable after being wound on a drum, having a diameter 12 times that of the cable, six times in one direction and six in the other, had withstood 175,000 volts for 5 minutes.

After discussing the relative costs of transformers, switchgear, and cable for 30,000 and 60,000 volts and higher pressures, Sir Philip explained that experience had shown that very much less trouble was encountered when using h.p. than l.p. lines, which was due to the fact that higher mechanical and electrical safety factors were allowed, and that the lines themselves were relied upon to withstand surges and not the so-called safety devices. For h.p. work the generators would probably be connected solidly to the transformers and the two regarded as a single unit.

In conclusion, the lecturer enumerated some of the advantages that electrification resulted in: 200 per cent. more traffic could be dealt with without any increase in expense for the provision of more lines, &c. The use of multiple unit motor-car trains for suburban work enabled the size of the trains to be varied so as to suit the number of passengers that required transporting, and a more frequent service could be run. Further, traffic was created in the middle of the day because passengers did not have to trouble about time-tables, and they knew they could catch a train at any time. However, the most economical operation would not be secured unless the whole of the line was completely electrified. Some large goods yards in America had been electrified and were operating quite satisfactorily. The L.B. & S.C. Co. had experimented in that direction, and had found that the average shunting speed of a steam locomotive was only 2.5 m.p.h., whereas by using a passenger motor car for the same purpose the speed could be increased to at least 5 m.p.h. An electric locomotive consumed no energy while it was standing idle, neither was there any deterioration of fire bars, &c.; it did not require coal and water to be carried about; the average speed could be increased, and heavier loads could be hauled; a constant torque and better adhesive load could be obtained.

The limit of size of steam locomotives had been reached at about 3,000 i.h.p. on account of boiler considerations, but electric locomotives had been built which developed 8,000 i.h.p. each, and that was by no means the limit. A saving in working expenses resulted from the fact that a smaller number of electric locomotives was required to do the work, and the cost of building a railway track could be reduced because increased gradients could be allowed.

Sir Philip covered the ground comprehensively, and ended his lecture by showing lantern slides which illustrated the various electric railway systems in America and on the Continent.

German Trade Activity in India.—Gradually the antipathy against German goods and German methods of business displayed during the war seems to be disappearing. The figures issued by the Director of Statistics in India regarding the extent of Indian trade with Germany show that that country is beginning to make a bid to secure the hold on the Indian market that she had before the war, and that she is succeeding to a large extent. It is strange, but true, that in the Indian bazaars a German-made article is often preferred to a British article, the reason probably being that German goods have a reputation for cheapness. The present rate of exchange enables the German importer to sell many things, in the making of which the Germans have specialised, at prices which are lower than those of any other country and still yield him a handsome profit. The shopkeeper in the Indian bazaar appears to be under the impression that to say an article is made in Germany is to give it the hall mark of value. In this connection a point worth noting is that German goods are now ousting from the Indian market the produce of Japan which, during the war, supplanted Germany as the principal provider of the many cheap trifles which find such a ready sale in India.—*Indian Textile Journal.*

REVIEWS.

The Real Wealth of Nations, or A New Civilisation and its Economic Foundations. By John S. Hecht, Fellow of the Royal Economic Society. Pp. ix+350. London: George G. Harrap & Co., Ltd. 1920. Price 15s. net.

The science of economics, as Mr. Hecht remarks several times in the course of his book, is sometimes called "the dismal science." The perusal of the work, while giving rise to some doubt in our mind as to the strict applicability of the term "science," in no way invalidates the complete appropriateness of the adjective. There is probably no subject, with the possible exception of religion, which has produced, in the minds of really earnest and capable students, so many conclusions, the variety of which is only equalled by the passionateness of the conviction with which they are held, urged, and maintained.

There can be no two opinions as to the thought and effort that Mr. Hecht has put into the writing of *The Real Wealth of Nations*. As the carefully considered views of one who would seem, by his distinction, to be qualified to write on the subject, the book is well worth reading. Everyone will find in it something with which he can agree, and everyone will also find a great deal of controversial matter. Engineers, who are first and foremost trained brain-workers, will at once accept the statement that, of themselves, neither capital nor labour, nor the two of them together, can produce wealth at all, and that only when they are harnessed to brains and skill can they become productive.

Summed up, the book is an attempt to prove that only by means of an *adequate* system of protection can a country be really wealthy. Protection enables the development of infant industries to be carried out. The "adequate" system amounts to prohibition, nothing less bringing about the object Mr. Hecht desires. Subsidiary questions, which used to be considered of some importance, are dismissed as not mattering at all, and certainly we have by now become so used to the depreciation of the purchasing power of money that to press the process farther by making it impossible for foreign imports to reduce the price paid for goods will only be another straw on the back of the patient beast of burden who has to bear the load. We shall be told that we have not read the book; that it is explained that the real trouble arises out of our having come to think of value in terms of money. We appreciate all that, and we quite see that money is an imperfect standard. But unfortunately, it is the only one available. We are compelled to realise that we have to deal with facts as they are, and not as we would have them be. There is really very little practical advantage to be gained by considering what would happen if Peter grew nothing but potatoes and Arthur grew nothing but artichokes, and they wanted to barter. There is not going to be a new civilisation, and Mr. Hecht may as well make up his mind to it first as last. We shall have to go on with the one we have got, and do our best to improve it.

The effective criticism of such a book as this would involve the writing of another one of equal length; and then no doubt the author would sit down and write a third, so that we might go on, past the point to which Touchstone takes the ethics of controversy, until we reached those sublime heights where dwell Mr. Ernest Newman and Mr. Edwin Evans, whose musical criticisms result in, if they do not aim at, the unending provision of material for the mutual disparagement of each other's intelligence, so that one really wonders at the patience of those who have to provide space for their publication.

It is not correct to suppose the cost of production of any given article as constant, and consisting of the necessaries of life of the producer and his dependents. Standardisation and production of large quantities in properly equipped factories make the cost of production follow a law of the character $y=mx+c$, the constant representing overhead charges, which diminish per article as the number of articles produced increases. While we are mentioning laws, we would point out that it is of no avail to rail against the so-called "law of supply and demand" as if it were of man's deliberate making. When a legislature makes a law, it says, in effect: "We would have things thus and so; and we will pass a law to compel people to act in such a way that things shall be thus and so." A scientific law, however, is a statement founded upon observation of a number of relevant cases, from which it has been observed so frequently that certain results follow certain causes, that it may reasonably be assumed that the same result will always follow when the same things are done. A scientific law is nothing but a theory, and it has been found, not infrequently, that the increase of knowledge makes a theory untenable, as in the case of the phlogiston theory. We fear that it is unlikely that any increase of human wisdom will bring about any result other than that when things are scarce people will charge more for them.

Mr. Hecht opens with a set of what he calls "the real axioms of economics." There are 31 of them. To be an axiom, a truth should be self-evident, neither requiring proof nor capable of it, but serving as a foundation for future reasoning. This is not the case with the majority of Mr. Hecht's axioms, some of which are more than arguable, while hardly any are self-evident. However, Mr. Hecht speaks throughout in an *ex cathedra* manner, and sets forth his definitions with an air of infallibility, while dismissing the dictionary definition of economics as "merely the personal opinion of the dictionary compiler"; whereas the fact is that even the youngest compiler of a dictionary must be guided, to quite a considerable extent, by the precedents established by those who were earlier in the field. Thus we are told, for instance, that wealth is something that exists. Mr. Hecht will have none of the view that coal in the ground, for instance, is worth nothing. Yet wealth can only result when production exceeds purchasing power, which seems to lead to the view that wealth involves movement, the doing of work, which, to our thinking, is much more reasonable.

Mr. Hecht has no good word for those engaged in selling goods. It is neither a skilful nor an honourable occupation. We all suffer, it is true, from the middleman, who too often becomes a simple profiteer, neither producing, transporting, making available, nor even seeing, the goods out of which he takes his toll. But the effective selling of the capacity of a factory is no less important than efficient manufacturing processes. This is, in actual fact, an age of competition. Whether it ought to be so or not is quite another question. So when we hear of some factories being on short time, while others in the same line are not, it may be taken as certain that the selling methods of the short-timers (assuming equally efficient manufacturing methods) are at fault, especially when the demands of the market are still far from being satisfied. And we would observe to Mr. Hecht that, in our view, George Stephenson invented the locomotive because he saw there was a need for it, a demand value for it; in a word, because he knew that if he made it there would be a sale for it. That may not sound romantic, but it is true, and there are few inventions in the scientific or practical world that have been made for any other reason. It is otherwise with works of art. A composer writes music, a poet poetry, a painter makes pictures, because he must, although he hopes to find a market for his product when he has completed it, and often thinks very little of the intelligence of the world if he fails to do so.

The truth is, that whether our object be ostensibly that of remaking the torn and war-exhausted world, making a new civilisation, or merely making the best of things as they are, the only course to adopt is to work as hard as possible, produce as much as possible, and spend as little as possible. Individually and collectively, all must play their part, and there must be no reliance on Government control, or Government regulation of profits, or paternalism of any sort. The world is a hard place, but, on the whole, it is not so hard but that the man who does his best can get something out of it.

We find much that is contradictory in the book, and much that we cannot accept as true. For instance, the sale of luxuries at home is injurious; yet if sold abroad their sale may benefit the producing country. Is not this suspiciously like the "romance of trade" at which Mr. Hecht jibes so bitterly earlier in his work? The statement criticised is to be found on p. 112. Again, on p. 225 we find: "Free trade can now be recognised through all its disguise as false, artificial, selfish, and materialistic. It allows those who are crafty or grasping to exploit the helpless . . . while a Protection based on the value produced per worker is natural, national, and moral . . . Bolshevism, it appears, is not a Russian menace, but the logical outcome of the teachings of the Victorian economists." This sounds perilously like nonsense. Dean Inge finds the genesis of Bolshevism in the ravings of disillusioned sentimentalists, and this view has at least the merit of tallying with the facts as we have all been able to observe them since Bolshevism was first established in Russia.

No, we cannot admit that Mr. Hecht has proved conclusively that Protection amounting to prohibition is the universal panacea for the ills of the troubled world, or even of the nation, and a civilisation is more than a national affair. We cannot do away with nationality—for ourselves, we do not want to do so, and have very little use for internationalism as a policy—but Mr. Hecht says in his subtitle that he is out for a new scheme of things, so he ought not to limit it to individual nations. He will not get any nearer than Omar Khayyam to shattering it to bits, and then remoulding it nearer to the heart's desire, and particularly it may be confidently said that he has not helped us very far along the road by his recommendations. X.

Aluminium: Its Manufacture, Manipulation, and Marketing. By George Mortimer, M.Inst.Met. Pp. viii+152. London: Sir Isaac Pitman & Sons, Ltd. 1920. Price 2s. 6d. net.

This little volume is one of Pitman's Common Commodities and Industries Series. It fills a distinct gap in technical handbooks, and it fills it decidedly well, because the author utilises the small space at his disposal not in wearisome repetition of facts already published *ad nauseam*, but in giving a great deal of matter known only to the expert, and what he does give us is really interesting and useful. Thus in the laudably brief account of the production of the metal, emphasis is laid on those details of electric furnace construction and operation which make all the difference between success and failure, and not on vague generalities leading nowhere. In this connection we are usefully reminded that the electrolytic recovery of aluminium looks beautifully simple and straightforward on paper, but nevertheless its successful commercial operation calls for the utmost care and vigilance, both as regards choice

of suitably pure material and in the regulation of the many delicate operations involved.

The chapter on "Alloys of Aluminium and their Treatment" is a highly-condensed *résumé*, full of useful information and some valuable tables, while the following chapter, "Hints on Working with Aluminium," will be found extremely helpful by the average engineer; the section on "Soldering" is particularly excellent, and for practical purposes it exhausts the subject. This completes Part I of the book, entitled "From Clay to Consumer."

The second half deals with "Applications"; namely, in automobiles and aircraft, in the chemical industry and alumino-thermics, and in the electrical industry, and again the author has covered a wide field in an extremely small space. Under the third heading the reminder that nearly 20,000 tons of aluminium (equivalent to double the quantity of copper) are employed on overhead transmission alone, serves to indicate the importance of this use of aluminium. During the war the Germans used aluminium for winding generators and transformers. This use can scarcely become normal, but for bus bars and connections aluminium is frequently becoming a serious competitor of copper. Here rise in temperature is one of the determining factors, and the greater area of radiation afforded by aluminium gives it a manifest advantage.

Another electrical application of aluminium of special interest is its use in winding magnet and other coils. The presence of the oxide film enables a pressure of ¼ volt to be safely withstood between turn and turn, and it is therefore possible to use *bare* wire for this purpose, so long as there is insulation between the layers.

These and numerous other examples that might be quoted show how great a field still remains open for aluminium to enter successfully, and we commend this little book to engineers as much for its suggestiveness in this connection as for the direct usefulness of the practical information with which it is crowded.

NEW PATENTS APPLIED FOR, 1921.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 885, High Holborn, London, W.C. 1.

4,770. "Annunciators, &c." E. A. Graham. February 10th.
4,772. "Automatic, &c., telephone systems." Relay Automatic Telephone Co., Ltd. February 10th. (Sweden, February 11th, 1920.)
4,777. "Electro-mechanically controlled telephone system." F. Aldendorff and H. Baron (Aldendorff). February 10th.
4,778. "Magneto-electric machines." British Thomson-Houston Co., Ltd. and A. P. Young. February 10th.
4,801. "Electrical apparatus." E. L. W. Byrne. February 11th.
4,810. "Supports for incandescent electric lamps." T. Clark. February 11th.
4,855. "Electric motors for talking machines." J. T. Sibley. February 11th.
4,858. "Manufacture of electrodes." W. G. Michel. February 11th.
4,865. "Measuring unbalance." Western Electric Co. (Western Electric Co., (Inc.). February 11th.
4,889. "Road vehicle electric lamps." A. G. Curnow and Howes and Burley, Ltd. February 11th.
4,896. "Arrangement of insulators of precipitating installations." E. R. Marks (Siemens-Schuckertwerke) and Siemens-Schuckertwerke. February 11th.
4,897. "Arrangement of high-tension insulators of electric precipitating installations." Siemens-Schuckertwerke. February 11th. (Germany, February 11th, 1920.)
4,900/1. "Magnetic chucks." Taft-Pierce Manufacturing Co. February 11th. (United States, November 5th, 1914.)
4,904. "Electron discharge devices." British Thomson-Houston Co., Ltd. (General Electric Co.), and General Electric Co. February 11th.
4,907. "Radio signalling systems, &c." Radio Communication Co., Ltd., and J. Scott-Taggart. February 11th.
4,917. "Telephone transmitters." A. F. Sykes. February 11th.
4,950. "Junction boxes." A. P. Rutherford. February 12th.
4,958. "Connection system for electric transformers." G. Campos. February 12th. (Italy, February 12th, 1920.)
4,959. "Electro-magnetic tractor." C. J. Coleman. February 12th.
4,964. "Automatic fuse indicator." F. G. Dunn. February 12th.
4,990. "Electric motors." H. F. Ponsford. February 12th.
4,995. "Electron discharge devices." A. C. Bartlett and General Electric Co., Ltd. February 12th.
4,997. "Switches." N. Pemberton-Billing. February 12th.
4,998. "Temperature indicators." British Thomson-Houston Co., Ltd. (General Electric Co.), and General Electric Co. February 12th.
5,001. "Coils for electrical transformers." British Electric Transformer Co., Ltd., and J. Roothaan. February 12th.
5,007. "Tubular wall plugs." J. J. Rawlings and Rawlplug Co., Ltd. February 12th.
5,014. "Electric lamp holder." W. M. Strickland. February 12th.
5,015. "Reduction of interference in wireless telegraphy and telephony." H. Morris-Airey, L. G. Preston, and G. Shearing. February 12th.
5,026. "Microphonic sound boxes for telephones, gramophones, &c." F. P. Fry. February 14th.
5,031. "Electric conductors for internal wiring of buildings." D. S. Munro. February 14th.
5,042. "Electric plug and socket couplings." J. A. Crabtree. February 14th.
5,050. "Interchangeable electric holder adaptor." W. M. Strickland. February 14th.
5,059. "Appliance for detecting or measuring electric currents." J. K. Catterson-Smith and C. W. Stopford. February 14th.
5,095. "Measurement of polyphase electric currents." Metropolitan-Vickers Electrical Co., Ltd. February 14th. (United States, February 13th, 1920.)
5,096. "Electrical measuring devices for polyphase circuits." Metropolitan-Vickers Electrical Co., Ltd. February 14th. (United States, February 13th, 1920.)
5,100. "Electric lamp holders." G. F. Ostlin. February 14th.
5,102. "Electric live wires or conductors." D. Adamson. February 14th.
5,107. "Transformer rectifier using both halves of the alternating current waves." Thorpe Electric Corporation. February 14th. (France, December 23rd, 1920.)
5,112. "Electro-deposition of metals." British Thomson-Houston Co., Ltd. (General Electric Co.), and General Electric Co. February 14th.
5,124. "Dead cable indicator." H. McCrudden. February 14th.
5,134. "Pre-heater for air in furnace plants, &c." Allgemeine Elektricitats-Ges. and F. Münzinger. February 14th.
5,135. "Heat exchanging apparatus." Allgemeine Elektricitats-Ges. and F. Münzinger. February 14th.
5,139. "Electric contact devices." J. W. Walker. February 14th.
5,144. "Terminal pieces for electric conductors." H. B. Cornish. February 15th.
5,145. "Electric switches." H. B. Cornish. February 15th.
5,170. "Anti-vibration devices for supports of electric lamps, &c." E. E. Hopwood and Wardle Engineering Co., Ltd. February 15th.
5,173. "Circuits for magnifying or transforming changes of voltage or current." W. H. Eccles and W. A. Leyshon. February 15th.
5,201. "Magnetos." G. Gibson, H. C. Heckman, and A. E. Smith. February 15th.
5,206. "Alternating current relay." F. B. Dehn (Takamine Commercial Corporation) and Takamine Commercial Corporation. February 15th.
5,210. "Holders for electric incandescent lamps." A. G. Mead and Mead & Jeffery, Ltd. February 15th.
5,211. "Electric incandescent lamps." A. G. Mead and Mead & Jeffery, Ltd. February 15th.
5,216. "Dynamo-electric machines." A. H. Midgley and C. A. Vandervell and Co., Ltd. February 15th.
5,217. "Electric switchboards for motor cars, motor boats, &c." A. H. Midgley and C. A. Vandervell & Co., Ltd. February 15th.
5,223. "Thermo-electric heat accumulating cooking stoves." S. Cristiani and S. Sacerdote. February 15th.
5,231. "Generation of high-frequency alternating electric currents." E. F. W. Alexanderson and British Thomson-Houston Co., Ltd. February 15th.
5,232. "Radio-transmitting systems." E. F. W. Alexanderson and British Thomson-Houston Co., Ltd. February 15th.
5,235. "Electric light pendants." J. E. Barber, H. M. Burr, and W. F. Merry. February 15th.
5,239. "Cut-out for electric circuits." K. Kellendorfer. February 15th.
5,246. "Mercury, &c., vapour electric lamps." F. Reynolds and Silica Syndicate, Ltd. February 15th.
5,248. "Measuring length of electric waves." J. S. E. Townsend. February 15th.
5,259. "Electrical transmission systems." A. M. Taylor. February 16th.
5,286. "Electric globes or tubes for use as advertising signs, &c." F. Oppalfens. February 16th.
5,293. "Wireless, &c., telegraphy and telephony." H. T. Moores and E. E. Stewart. February 16th.
5,340. "Incandescent electric lamps." C. E. Newman. February 16th.
5,341. "Electric switches." C. A. Damey. February 16th.
5,345. "Protective devices for electric distribution systems." British Thomson-Houston Co,, Ltd., A. S. Fitzgerald, and H. Pearce. February 16th.
5,347. "Electric switches." Cutler-Hammer Manufacturing Co. and Igranic Electric Co., Ltd .(Cutler-Hammer Manufacturing Co.). February 16th.
5,348. "Electric regulators." Cutler-Hammer Manufacturing Co. and Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). February 16th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1914.

12,156. "Electric gasfilled glow discharge lamps." Lederer. May 19th 1913.

1919.

9,316. "Wireless receiving and transmitting apparatus." J. Erskine-Murray and J. Robinson. April 11th, 1919. (158,005.)
15,937. "Methods of and means for obtaining alternating currents of any periodicity from existing systems of different periodicity." A. M. Taylor. June 25th, 1919. (Addition to 151,294, cognate applications 17,384, 1919 21,390, 1919, and 23,724, 1919.) (158,008.)
18,634. "Thermionic valves." L. A. McDougald. July 28th, 1919. (158,011.)
19,167. "Magnetic cores for dynamo-electric machine, transformers, electro-magnets, and the like." W. A. A. Burgess. August 2rd, 1919. (158,013.)
24,640. "Cooling of transformers and other electrical apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). October 8th, 1919. (158,027.)
25,435. "Renewal of the filaments in metal filament electric lamps." S. Coxon and W. A. Williams. October 17th, 1919. (158,034.)
25,815. "Controllers for electric motors." British Thomson-Houston Co., Ltd. (General Electric Co.). October 21st, 1919. (158,045.)
25,817. "Electric ignition systems for internal-combustion engines." M. A. Codd. October 21st, 1919. (158,046.)
25,999. "Means for supporting electrical conduits and cables, pipes, rods, and the like." L. R. Lee. October 23rd, 1919. (158,059.)
26,016. "Electrically operated horns for motor vehicles." G. Frecheville. October 23rd, 1919. (Addition to 153,098.) (158,060.)
26,165. "Controllers for electric motors." British Thomson-Houston Co., Ltd. (General Electric Co.) October 24th, 1919. (158,067.)
26,190. "Electric torches." A. A. King. October 25th, 1919. October 25th, 1919. (158,070.)
26,223. "Electrically heated cooking utensils." N. C. Joseph. October 25th, 1919. (158,073.)
26,279. "Form of thermo-electric measuring instrument." C. M. R. Balbi. October 27th, 1919. (158,076.)
26,313. "Ventilation and cooling of electrical or other machines." K. Baumann and Metropolitan-Vickers Electrical Co., Ltd. October 27th, 1919. (158,081.)
26,314. "Ventilation and cooling of electrical or other machines." J. E. Jolly and Metropolitan-Vickers Electrical Co., Ltd. October 27th, 1919. (158,082.)
26,332. "Production of aluminium nitride by electrically-generated heat." Armour Fertiliser Works. July 10th, 1919. (146,919.)
26,347. "Means for controlling the transmission of electrical impulses." Sykes Interlocking Signal Co., Ltd., and W. R. & R. W. Tarrant. October 27th, 1919. (Cognate application, 8,897, 1920.) (158,085.)
26,488. "High frequency alternators," E. F. W. Alexanderson. November 4th, 1918. (134,830.)
27,804. "Electromagnets for magnetising permanent magnets." A. Lusy. February 1st, 1918. (135,188.)
29,813. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and G. W. Flynn. November 29th, 1919. (158,141.)
30,396. "Magneto-electric machines." C. E. P. Julien and ,B. Wolkoff. August 27th, 1919. (150,296.)
32,790. "Electrolytic gas generators." I. H. Levin. December 31st, 1919. (158,148.)

1920.

502. "Limit switches for controlling electric motors." E. T. Caparn. January 7th, 1920. (158,150.)
4,950. "Control mechanism for electric cars provided with pneumatic brakes." Westinghouse Electric & Manufacturing Co. February 18th, 1919. (139,191.)
5,846. "Circuit breakers with automatic variation of the ignition for internal-combustion engines." J. E. Tuscher. February 20th, 1920. (158,157.)
16,064. "Production of high unidirectional voltages from an alternating voltage." Siemens-Schuckertwerke Ges. May 15th, 1918. (Addition to 143,455.) (145,089.)